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LIPIODOL IN THE DIAGNOSIS OF BRONCHOPULMONARY LESIONS BY THE BRONCHOSCOPIC METHOD

REPORT OF FIFTY CASES *

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An event of far reaching importance to medicine was the introduction of lipiodol in radiology by Sicard and Forestier [1] in 1922. They first employed it in the localization of spinal cord tumors, and later suggested that it might be utilized in the exploration of the bronchial tree. Sergent and Cottenot,[2] in 1923, were among the first to study bronchial dilatations in the adult by means of lipiodol, while Armand-Delille [3] and his co-workers applied it for the same purpose in children. These investigators and others confined their work principally to the study of bronchiectasis, and counselled against injections in patients with pulmonary tuberculosis, owing to the possible pulmonary congestion resulting from its use.

Chevalier Jackson [4] outlined the bronchial tree by insufflating dry bismuth subcarbonate powder, and Lynah [5] utilized a preparation of bismuth in oil in mapping out abscess cavities. The great disadvantage of bismuth in oil is that it is too viscid and will not flow and outline the fine bronchioles. It is not absorbed by the lung tissue and it has been found to be somewhat toxic. Lipiodol has not as yet been proved to have any of these disadvantages.

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* From the Brochoscopic Clinic of the Royal Victoria Hospital.

* Read before the Montreal Medico-Chirurgical Society, Nov. 20, 1925.

1. Sicard, J. A., and Forestier, G.: Méthode générale d'exploration radiologique par l'huile iodée, Bull. et mém. Soc. méd. d. hôp. de Paris **46**:463-469 (March 17) 1922.

2. Sergent, E., and Cottenot, P.: Note sur l'étude radiologique de l'arbre tracheo-bronchique au moyen, d'injections intra-trachéales de lipiodol, Bull. et mém. Soc. méd. d. hôp. de Paris **48**:693 (May 11) 1923.

3. Armand-Delille, P. F.; Duhamel, G., and Marty, P.: Le diagnostic de la dilatation bronchique chez l'enfant au moyen, du lipiodol, Presse méd. **39**: 421 (May 14) 1924.

4. Jackson, Chevalier: The Bronchial Tree—Its Study by Insufflation of Opaque Substances in the Living, Am. J. Roentgenol. **5**:454 (Oct.) 1918.

5. Lynah, H. L.: Lung Mapping by the Injection of Bismuth Mixture in the Living, Tr. Am. Laryngol. Soc., May, 1920.

Lipiodol is an odorless, tasteless, amber-yellow vegetable oil, containing 40 per cent by weight of iodine with a specific gravity greater than water. Its great virtue lies in the fact that it is perfectly innocuous and is tolerated by lung tissue. Furthermore, owing to its iodine content and slow elimination, it seems to exert some beneficial action on the lung. It, therefore, affords us a safe and satisfactory means for the study of the anatomy of the bronchial tree and its ramifications.

Lipiodol is readily absorbed by the alveoli. In some cases it is almost instantaneously taken up after its injection in the bronchioles; in others, especially when we are dealing with dilated bronchi and lungs in which there are pathologic changes, the process is much slower. This is especially true in cases of bronchiectasis, in which lipiodol was still found present in the alveoli of the lung two months after injection.

TECHNIC

The method, as employed by its French originators and by Leroux, Sergent, Cottenot and Armand-Delille and others, was the intratracheal injection of lipiodol through the cricothyroid membrane. Preliminary anesthesia of the cricothyroid space with a 1 per cent solution of procaine is obtained; the trachea is then entered through the membrane with a trocar and cannula curved like a tracheotomy tube. The trocar is then withdrawn, the trachea anesthetized, and the lipiodol injected through the cannula, after which the latter is withdrawn, and roentgenograms are taken in the horizontal and vertical positions. There is the danger in this method of laryngeal edema, of a false passage, and of local infection; a fatal case due to this cause was recently reported by Leroux and Bouchet.[6] The picture obtained by this method is imperfect in many respects.

I have employed the same bronchoscopic technic for lipiodol injection that I have used in bronchoscopic diagnosis and treatment. I consider this to be the ideal and safest method; it can be repeated any number of times; it gives one an excellent opportunity of studying the interior of the trachea and bronchi, allowing one to explore the different lobes of the lungs more readily, and to aspirate pus and secretion, which is so essential in the mapping out of abscess cavities and of such importance in differential diagnosis.

PREPARATION

Patients are examined early in the morning on an empty stomach. They usually receive a hypodermic injection of morphine, or pantopon, and atropine, one half hour before the local anesthetic is applied. In

6. Leroux, L., and Bouchet, M.: Sur les accidents des injections. Intratracheales methode inter-crico-thyroidienne, Bull. et Mem. Soc. franç. de Laryngol., Oct., 1925.

some, I dispense with the preliminary hypodermic. After thoroughly anesthetizing the larynx and trachea with a mixture of one part 20 per cent cocaine and three parts 1 : 1,000 epinephrine chloride solution, the bronchoscope is passed, the bronchi anesthetized, and their contents aspirated. Warmed lipiodol is then injected through the bronchoscope into the different lobes of the lung under direct vision. The bronchoscope is then immediately withdrawn and roentgenograms are taken. This procedure is carried out in the roentgen-ray examining room, with the patient always in the dorsal decubitus position, and the head resting on the table. A nurse is my only assistant.

As a routine, a preliminary roentgenogram is taken before the lipiodol injection. Studies have been made in this series with and without the Potter Buckey diaphragm, the former giving sharper outline to the bronchial tree, the latter showing finer detail of the lung parenchyma. The effect of posture, of respiratory movements, of spasms of coughing, and the use of local heat have been studied. A series of roentgenograms were taken at intervals of four minutes to study the rapid changes taking place in the lung after alteration of the position of the patient. Plates were first taken in the horizontal decubitus; while in this position the head was lowered and then raised to 45 degrees, and roentgenograms taken. Postero-anterior views were also taken, first in the prone position and then with the head lowered in order to fill up the upper lobe; lateral and stereoscopic views in the sitting and lying positions were also taken. A dozen pictures were taken in one series.

Dissemination of the lipiodol has been observed through the fluoroscopic screen, and the rapidity with which it is taken up by the alveoli in some cases has been noted.

DOSAGE

The amount of lipiodol injection has varied with the degree of confidence I have gained from its use. In the first patients I used insufficient doses. I began with 5 cc. in a patient whom I had been treating for a year for chronic bronchiectasis, and have since injected 40 cc. in the same person without any ill effects. This was the largest quantity used, and I do not think that we should exceed this limit. I have injected only one lobe or corresponding lobes of both lungs, or an entire lung, or more or less completely filled up both lungs, in order to show the marked contrast between the appearance of the diseased and the normal lung. When there was reason to believe that one lung was normal and the other diseased, the latter only was injected.

A number of my patients were ambulatory and, after injection, returned home the same day. One patient with bronchiectasis who,

for his third bronchoscopic injection had 40 cc. of lipiodol, received no preliminary hypodermic, left the hospital at 12:30 p. m. and was at work at 1 o'clock.

AFTER-EFFECTS

Some patients suffer from a slight sore throat the next day. Two patients with pulmonary tuberculosis had an elevation of temperature for a few days after the treatment, but no signs of further activity could be noted. Apart from the discomfort of the sensation of a lump in the throat from the local anesthetic and the instrumentation, most patients suffer little if any pain and scarcely any dyspnea. I have injected lipiodol into febrile patients with active pulmonary tuberculosis, three of whom had had hemoptysis, only one month previously without ill effect. No iodism has occurred. I have seen but one questionable ill effect from the very careful use of the local anesthetic, employed in over 300 bronchoscopic treatments during the last three years, in patients whose ages ranged from 12 to 65 years. One death is reported, in which the cause was apparently an acute dilatation of the heart. This was a moribund patient in whom the necropsy diagnosis was acute pneumonic phthisis in one lung, and unresolved pneumonia in the other. The roentgenogram of the skull failed to show any evidence of fat embolism.

INDICATIONS

Indications for the lipiodol injection are, according to our very limited experience, all forms of chronic pulmonary, bronchial or pleural suppuration and selected cases of pulmonary tuberculosis. I feel that those conditions of pulmonary tuberculosis that show little in the way of healing and resistance as expressed by fibrosis, should be injected with caution, and only if requested by the internist. Patients to be investigated are those in which it is difficult by physical examination, and the ordinary roentgenogram, especially when the lesion is on the left side and masked by the cardiac shadow and pleural thickening, to decide whether the suppuration is due to bronchiectasis, a lung abscess, or a localized interlobar empyema communicating with the bronchus. As an aid to the localization of nonopaque foreign bodies, and in the differentiation between upper and lower lobe, and pulmonary and pleural lesions, it is most valuable.

The series of my first fifty lipiodol injections thus includes a study of the normal bronchial tree already reported,[7] deviations of the trachea and bronchi; bronchial stenoses; asthma; bronchiectasis; lung abscess; pulmonary fistulas; empyema and bronchial fistula; various forms of pul-

7. Ballon, David, H.: The Injection of Lipiodol as an Aid in the X-Ray Diagnosis of Broncho-Pulmonary Lesions, Including Tuberculosis, Canad. M. A. J. **15**:995-999 (Oct.) 1925.

monary tuberculosis including acute miliary, tuberculosis after thoracoplasty,[8] and with associated bronchiectasis; acute pneumonic phthisis; primary carcinoma of the bronchus, tumor of the pleura; as well as a study of the various respiratory movements and phases of coughing.

NORMAL

In the normal lung, the trachea is centrally placed and the bronchi are seen as regular branching shadows becoming smaller in size and less obvious as they approach the periphery. The bronchial arborescences extend much further over the diaphragm than one would be led to believe, and are mapped out with lipiodol to the very finest ramifications.

BRONCHIAL STENOSIS

Stenoses in the bronchial tree are as readily recognizable by this method as are those of the gastro-intestinal and urinary tract. In a

Series of Fifty Lipiodol Injections

Disease	No. of Cases	No. of Injections
Normal	1	1
Asthma	1	1
Primary carcinoma of the bronchus	1	1
Empyema and bronchial fistula	1	1
Tumor of the pleura	1	1
"Gassed"	2	2
Pulmonary fistulas	6	6
Lung abscess	6	7
Bronchiectasis (four patients had two injections; one had three injections (1) 10 cc., (2) 30 cc., (3) 40 cc.)	11	17
Tuberculosis (1 acute miliary, 2 fibroid, 4 after thoracoplasty, 5 apical cavities and associated with bronchiectasis, 1 acute pneumonic phthisis)	13	13

case of stenosis of the left main bronchus, the lipiodol penetrated only for a short distance, leaving the left lung unfilled, while the right was completely mapped out. In one case of bronchial asthma, the injected lung was identical in appearance with that of a normal lung.

LUNG ABSCESS

With this method, our ideas of lung abscess are being clarified. When a true abscess cavity is completely filled with pus the abscess cavity will not fill with lipiodol, and the resultant effect is absence of any shadow. This is apparently due to the fact that expectoration in these cases is but overflow, rather than actual emptying, as in the tuberculous or bronchiectatic cavity. In such cases of lung abscess, therefore, when there has been no preliminary expectoration or when the latter has been ineffective, the partly filled bronchus presents a sharp, clear-cut end

8. Archibald, Edward: Demonstration of Pulmonary Changes in Tuberculosis by Lipiodol Injection, Canad. M. A. J. **15**:1000-1002 (Oct.) 1925.

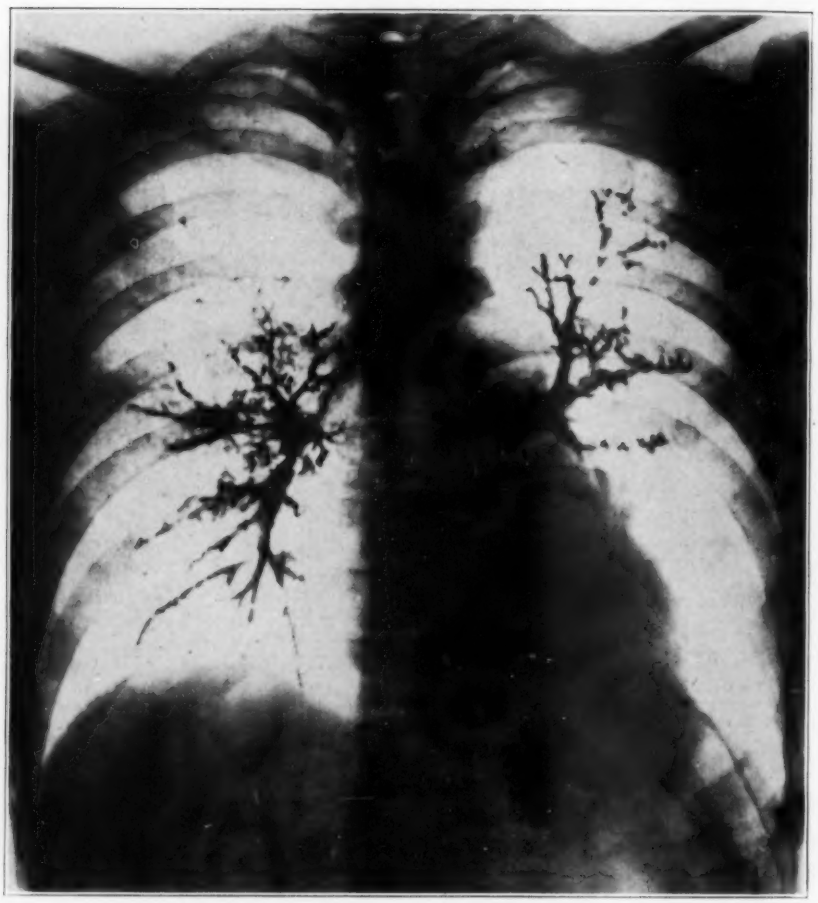

Fig. 1 (case 1).—Lung abscess in the left lower lobe. Twenty-five cubic centimeters of lipiodol was injected. Bronchial tree in the lower half of the right lung is normally filled, but the lipiodol stops short in the lower main bronchus of the left lung as if the bronchus was constricted or blocked in the region of the abscess. Some lipiodol is shown in the stomach, which the patient coughed up and swallowed. Before injection, the roentgenologic findings were negative. Subsequently, an operation was performed by Dr. Edward Archibald and the diagnosis was confirmed.

as if terminating in a cul-de-sac. Consequently, we find a "silent" area of the lung. We have, therefore, an excellent means at our disposal of differentiating between a true lung abscess and a bronchiectatic or tuberculous abscess cavity. The latter readily empty themselves and can be readily filled. It is important to inject the sinuses of the patients

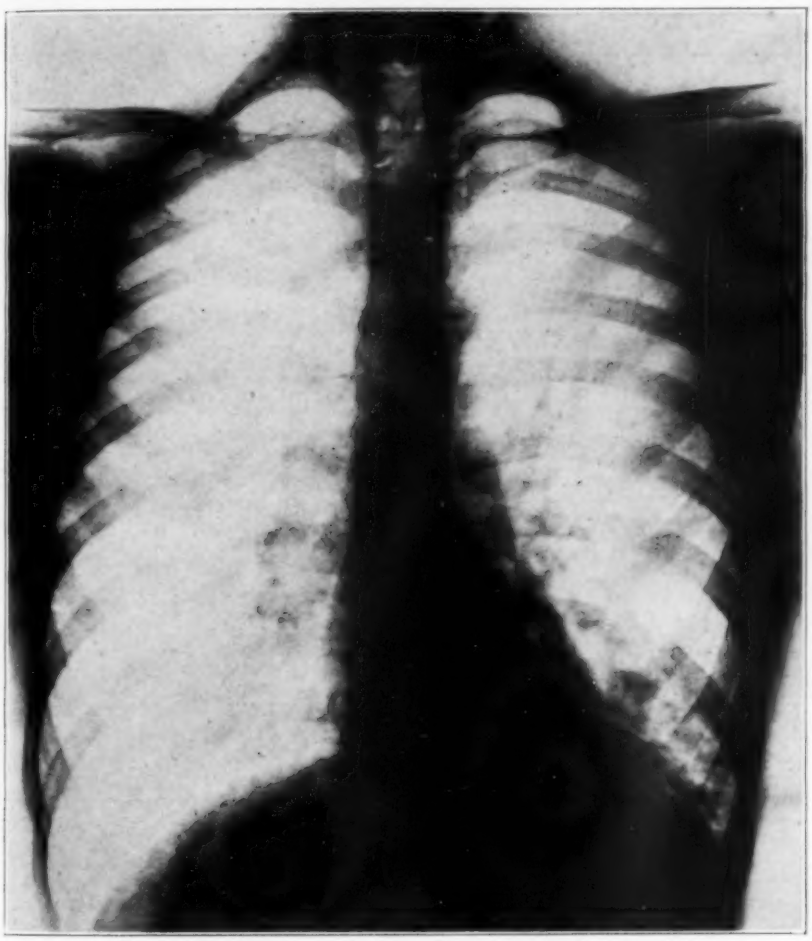

Fig. 2 (case 2).—Bronchiectasis, with bronchiectatic abscesses, before injection, in a boy, aged 13, a patient of Dr. Roddick Byers.

on whom an operation for lung abscess had been performed in order to demonstrate not only the size of the cavity and the presence of associated bronchiectasis, but also to show by repeated injections the amount of bronchiectasis which has developed as a result of spasms of coughing and respiratory movements.

BRONCHIECTASIS

The great triumph of this method has been in the diagnosis of bronchiectasis. In a large number of cases in which the ordinary roentgenogram conveys little information and the physical signs are indefinite, we can now make an absolute diagnosis. We can appreciate how invaluable this method is from the point of view of the patient's

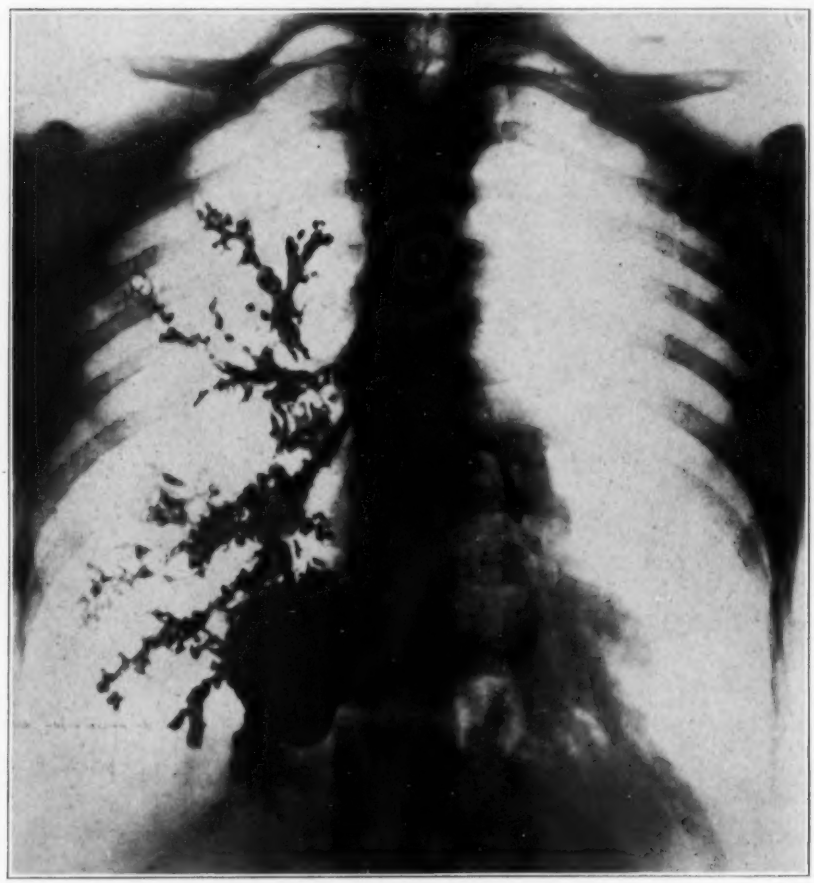

Fig. 3 (case 2).—Bronchiectatic abscess, the size of a small egg in the right lower lobe, which was invisible by roentgenogram before the injection of 25 cc. of lipiodol.

prognosis and treatment, as formerly not a few were treated in sanatoriums for tuberculosis. In a case referred to me by Dr. Roddick Byers (case 2) with the diagnosis of bronchiectasis with lung abscesses, the roentgen-ray findings before injection were practically negative. After the lipiodol injection, large bronchiectatic cavities the size of small

hens'-eggs were seen in both lower lobes. Bronchial dilatations situated at the left base completely obscured by cardiac shadows were outlined in a most astounding manner. The typical shadows cast in this condition are illustrated in figure 4. Bronchiectasis appears to have a selective action on the lower lobes of the lung which were involved in all the patients examined. The left lung was involved in five, the right

Fig. 4 (case 2).—Bronchiectatic absceses in both lower lobes at the level of the diaphragm on either side of the spine. One week later 25 cc. of lipiodol was injected into both lower lobes. Two months later traces of lipiodol were still present in the lung. The ordinary roentgenogram will not demonstrate an abscess or bronchiectasis in the left lower lobe owing to the cardiac shadow.

lung was involved in three, and both lobes were involved in three cases. The ages of the patients ranged from 12 to 39 years, eight of whom were in the second decade. The usual roentgenologic report prior to the injection was that "the bronchial tree was intensified." It failed to demonstrate even large abscess cavities, and of course conveyed no information of the condition of the left lower lung. It is interesting to

note that pulmonary hemorrhages were quite frequent, and that six out of eleven patients were treated for some time in sanatoriums for tuberculosis.

PULMONARY TUBERCULOSIS

In cases of pulmonary tuberculosis, lipiodol renders valuable service to the thoracic surgeon by intimating the extent of the lesion, the localization of cavities, the presence of associated bronchiectasis and the extent of normal lung tissue. It is surprising how much bronchiectasis

Fig. 5 (case 3).—Bronchiectasis in a man aged 32, a patient of Dr. Archibald. Twenty cubic centimeters of lipiodol was injected into the right lung only. The lateral view, with the patient lying on his face shows the bronchial tree filled normally toward the front of the chest; bronchiectasis is shown towards the posterior part.

is found to be associated with cases of pulmonary tuberculosis or, for that matter, lung abscess. The ordinary roentgenograms of cases of pulmonary tuberculosis after thoracoplasty were very indefinite and of doubtful value, while, after lipiodol injection, cavities were clearly outlined, affording a definite means of judging before operation the results to be obtained by collapse or operative interference. Furthermore, it demonstrated the operative reason for failure in the decrease in coughing and the diminution of the expectoration for which the patient sought

relief. It clearly showed the position of a cavity in relation to the hilum and the associated bronchiectasis. The presence of a large cavity at the hilum or extensive bronchiectasis communicating with a large bronchus undoubtedly will not respond very successfully to collapse. In several cases of tuberculosis, tubercle bacilli were obtained from a smear taken directly from the bronchus. In a case of general miliary tuberculosis, the bronchi, apart from being slightly dilated, were normal, while the rest of the lung tissue gave what was apparently a normal

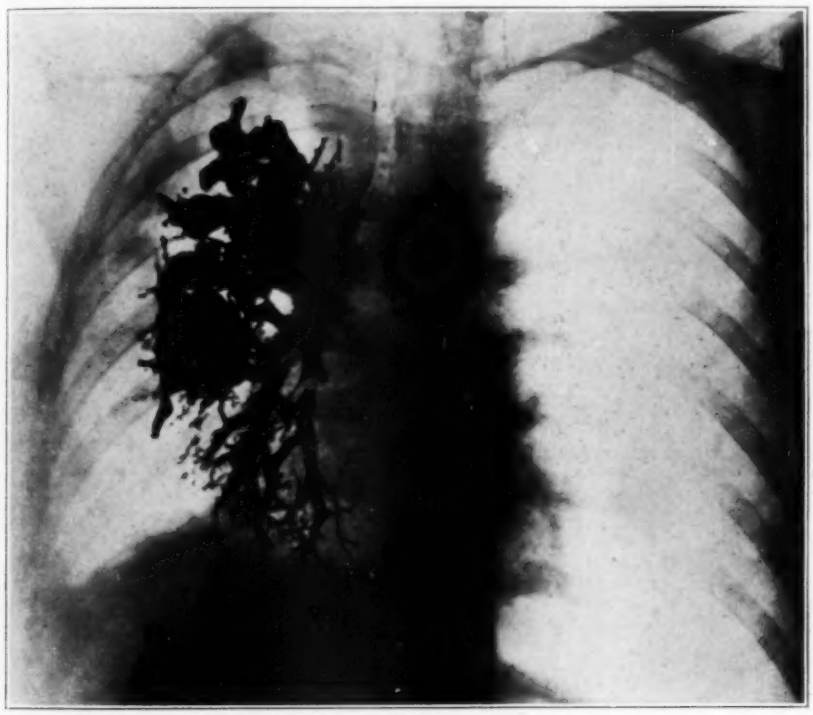

Fig. 6 (case 4).—Pulmonary tuberculosis in a girl, aged 18, a patient of Dr. Edward Archibald. Thirty cubic centimeters of lipiodol injected into the right lung only shows cavities in the upper right lobe.

injection. I have injected a number of apical tuberculous cavities. In chronic tuberculosis, marked displacement of the trachea was shown. Nine of the thirteen cases were from the service of Dr. Edward Archibald.

NEW GROWTH

I have injected only one case of tumor, which was apparently primarily in the bronchus. Here the failure of the lipiodol to enter the bronchus, as well as the numerous snippings taken through the bronchoscope, enabled one to make the diagnosis of carcinoma in a case in which

Fig. 7 (case 4).—Pulmonary tuberculosis, lateral view.

Fig. 8 (case 5).—Pulmonary tuberculosis in the left lung with cavity at apex, also extensive bronchiectasis, in a man, aged 35, a patient of Dr. Archibald. Thirty cubic centimeters of lipiodol was injected, which shows that the right lung was normal. The roentgenogram taken before injection showed nothing to suggest bronchiectasis.

the history was suggestive of true lung abscess following gastro-enterostomy. This patient had also been operated on for lung abscess; the bronchoscopic examination and the postoperative injection revealed the true underlying condition of carcinoma with the abscess only a secondary condition. In the case of true tumor of the lung, the picture obtained resembles that of a pyelogram of a renal tumor.

Fig. 9 (case 6).—Chronic empyema with right bronchial fistula in a man, aged 54, a patient of Dr. Archibald. Twenty-five cubic centimeters of lipiodol was injected. Before injection, a photograph made with the patient lying on his back showed a dense area in the outer half of the right lung with a raised and adherent diaphragm. The first picture after lipiodol injection shows that the lipiodol has passed through into a pneumothorax containing fluid, and has broken up into blobs of oil which lie like bullets detached in the pneumothorax. No disease is shown in the parenchyma of the right lung.

LESIONS OF THE PLEURA

In diseases of the pleura (and in this group I include particularly the thickened pleura which obscures the underlying picture and consequently gives varied signs and symptoms) lipiodol is undoubtedly of diagnostic value. Here an injection has revealed the true position of the diagram, the topography of the normal lung, the presence of a collapsed lung, associated fluid or adhesions. Into this group also comes

the bronchial fistula and chronic empyema cavity. The use of lipiodol in these latter cases far surpasses Beck's paste. Thus, in the case of a chronic empyema cavity which has failed to close, a preliminary injection of the lung with a lateral view taken before and after injection will reveal the true nature and extent of the empyema cavity which in many cases is of the dumbell type, in which the upper portion is not draining. In these cases, one does not fear the retention of the lipiodol as one does other drugs similarly employed. In one patient, a tumor of the

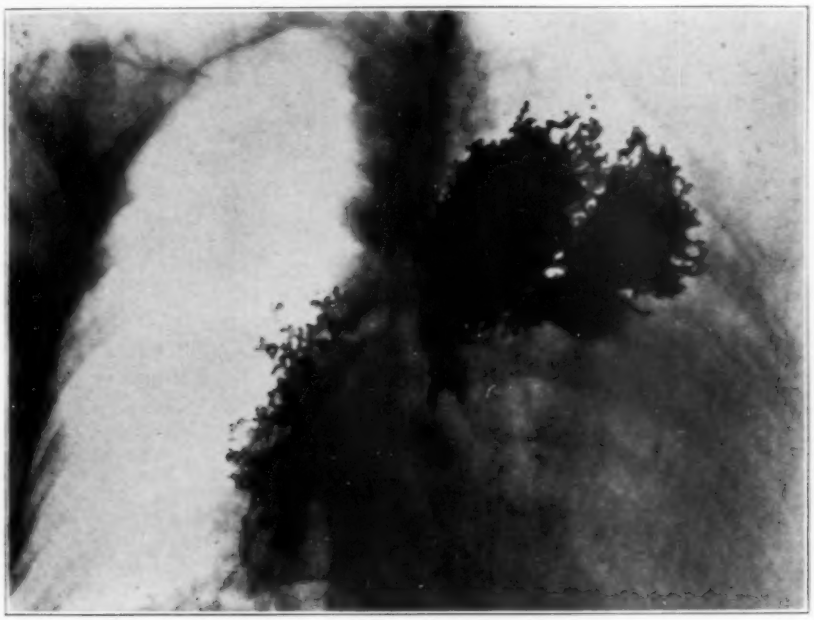

Fig. 10 (case 7).—Tumor of the pleura, in a man, aged 65. Thirty-five cubic centimeters of lipiodol was injected into the right lung. Roentgenologic report before injection: right side of the chest was completely dense from the level of the second rib in front downward. The heart and aorta were not displaced. The lipiodol entered only the upper third of the right lung and gave a normal appearance there, none is shown in the lower two-thirds. The appearance suggests that the middle and lower lobes are compressed either by fluid or by new growth.

pleura was injected, the picture obtained being illustrated in figure 10. The lipiodol filled up only the upper lobe and resembled a cauliflower in appearance; it did not enter the lower lobe on account of the compression and the lack of thoracic respiration.

PULMONARY FISTULAS

Pulmonary fistulas can be clearly demonstrated and with safety by bronchoscopic or external injection of lipiodol. In injecting external

fistulas, valuable information was gained, by establishing their connection with lung or bronchi or by demonstrating that they were merely empyema cavities. In some, the lipiodol ran through the diseased lung into the normal one, outlining both, together with the trachea, the patient coughing up and tasting lipiodol.

STUDIES OF RESPIRATION

In my first studies of respiratory movements, inspiration and expiration were registered on separate films. Later, at Dr. Pirie's suggestion,

Fig. 11 (case 8).—Bronchiectasis in the right lower lobe. A study of respiratory movements. A double exposure of the patient in the dorsal decubitus position was made on one film during deep inspiration and full expiration. Bronchioles in bronchiectatic area have thus cast two definite shadows —one during inspiration and another during expiration. The shadow during inspiration is larger than that during expiration.

a double exposure was made on the same film during deep inspiration and full expiration. A double shadow is thus cast, in which the shadow cast during inspiration is larger than that during expiration. In this way, one can compare the changes occurring in the bronchi and bronchioles during respiration.

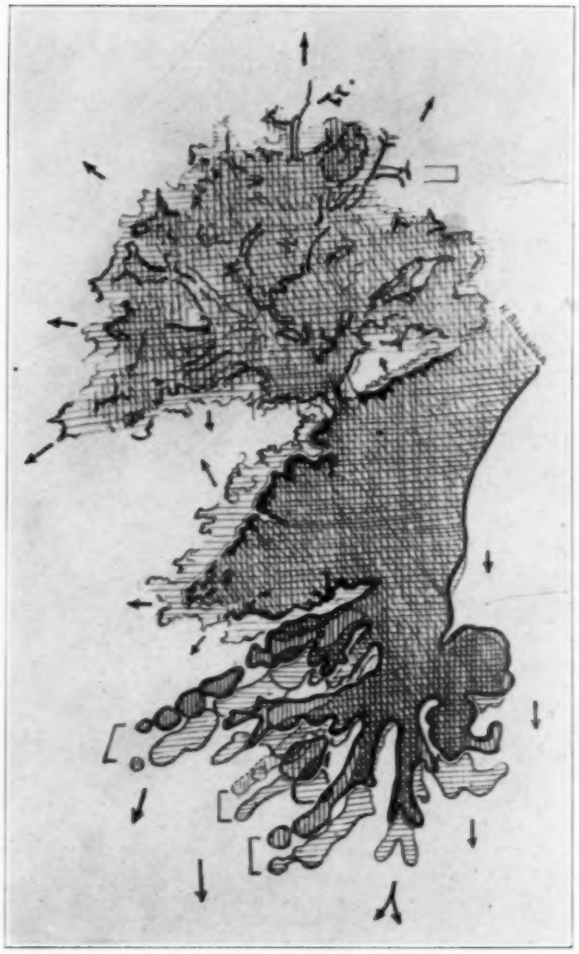

Fig. 12 (case 8).—This illustrates more clearly the direction of the respiratory movements and the excursion between inspiration and expiration in the different lobes of the right lung. The paler horizontal lines indicate inspiratory movements, while the darker perpendicular and oblique lines denote expiratory movements.

During inspiration, a general expansion of bronchi and bronchioles begins near the hilum and spreads in all directions, the greatest expansion being downward at and near the hilum, less outward about the midlung, and least upward at the apex. Near the diaphragm, the respiratory movements in the bronchioles are upward and downward

Fig. 13 (case 8).—Bronchiectasis in the right lower lobe in a youth aged 16. Thirty cubic centimeters of lipiodol was injected into the right lung and 2 cc. into the left lung. Stereoscopic picture in the sitting position before coughing.

with excursions of about half an inch. As we approach the middle of the lung, the movement is more or less horizontal. At the apexes the movements are slight. Observations on the lung parenchyma are less definite than on the bronchioles, owing to the diffuse shadow cast by the parenchyma. The darker shadows observed in some areas of the lung are due to superimposed layers of lipiodol.

COUGHING

What actually occurs during a spasm of coughing is convincingly demonstrated in figures 13 and 14, taken before and after coughing. These roentgenograms were taken with the patient in the sitting position, with only a few minutes interval. It shows how the lipiodol was practically forced out from the bronchiectatic cavities in the lower lobe

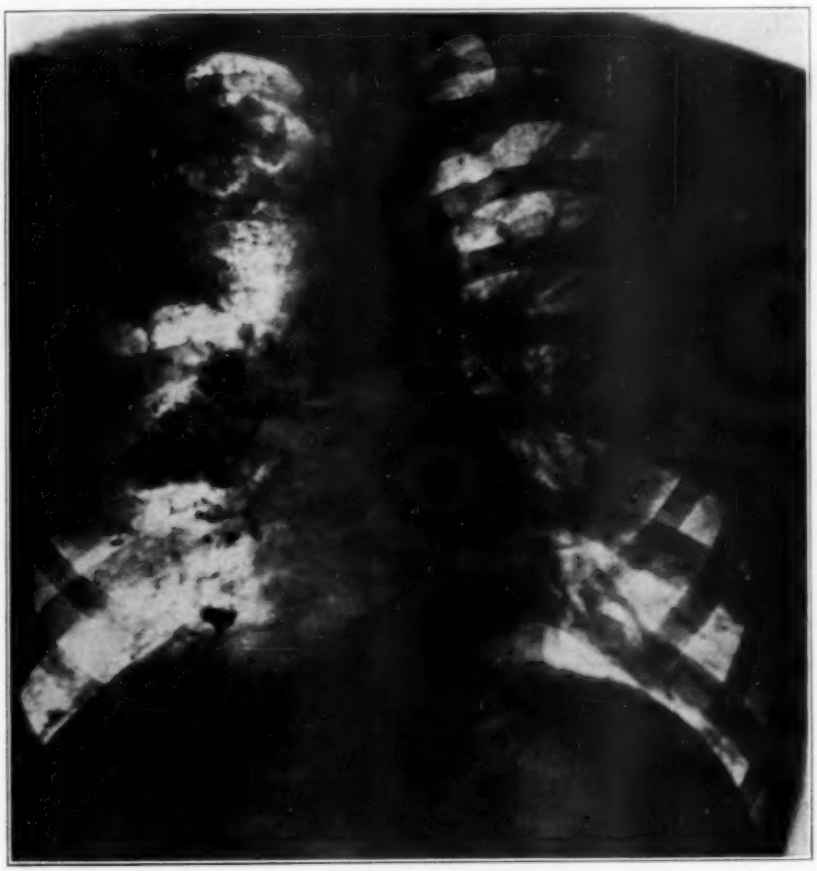

Fig. 14 (case 8).—Bronchiectasis stereoscopic picture in the sitting position after coughing. Note the marked contrast between the two pictures. The penciled outline of the trachea has disappeared. The bronchiectatic cavities at the base have been almost completely emptied. The lipiodol has been disseminated into the parenchyma of the lungs. It demonstrates how infective material and medication could be projected throughout the lungs.

and disseminated all through the lung tissue even at the apexes. After coughing, the bronchial outlines became only faintly visible. This clearly demonstrates how in a few minutes in patients with active cough reflexes, aspirated infected material is scattered throughout the lung and is rapidly absorbed by the parenchyma.

This knowledge gained of how coughing splashes the lipiodol throughout the whole lung, projecting it from the lower lobe into the upper and even into the other lung, may explain the causation of pulmonary infections as well as point a way to pulmonary medication.

THERAPEUTICS

Hasty conclusions cannot be drawn in regard to the therapeutic value of lipiodol, as our experience is still too recent. In one case of bronchiectasis I have found a distinct diminution in the quantity of discharge, a lessening of the cough and a general improvement in health. This patient had two injections.

CONCLUSIONS

1. The bronchoscopic method of injecting lipiodol is safer and more satisfactory than any other method by virtue of the added diagnostic advantage from having observed by direct vision the actual condition in the bronchi and lungs.

2. The quantity of lipiodol injected varies from 10 to 40 cc.

3. The topography of normal trachea and bronchi are clearly shown, and stand out in marked contrast to the pathologic.

4. Bronchial stenosis is recognizable.

5. True lung abscess which remains either partly or wholly unfilled, is readily differentiated from a bronchiectatic abscess or a tuberculous cavity which fills readily.

6. Bronchiectasis is diagnosed at a glance. This is especially important in lesions of the left base masked by cardiac shadow in which the ordinary roentgenogram failed to show even a large abscess.

7. In pulmonary tuberculosis, cavities are localized; the presence and extent of associated bronchiectasis and normal lung are demonstrated.

8. The thoracic surgeon has a useful means of deciding whether or not to operate, the extent of operative interference, and the prognosis.

9. New growth of the bronchus must be diagnosed bronchoscopically. Lipiodol is only an aid.

10. Bronchial fistulas and empyema cavities are clearly defined.

11. Respiratory studies show the changes occurring in the bronchi and bronchioles during respiration.

12. Studies of the act of coughing illustrate how, during a spasm of coughing, the lipiodol or infected material could be projected from the lower lobes and disseminated throughout the entire lung even at the apexes.

BRONCHOSCOPIC REMOVAL OF SAFETY-PINS*

CHEVALIER JACKSON, M.D., Sc.D.
PHILADELPHIA

A safety-pin occurring as a foreign body is not merely a safety-pin, but is a mechanical problem that varies widely from the easy to the difficult, depending not merely on the general factors of age of the patient and location of the foreign body in the patient, but vastly more on the size, shape, spread and stiffness of spring of the pin, and the thickness of the wire of which it is made. A pin that has been in the lung for many years may be so corroded as to present no problem other than the picking up of the fragments into which it crumbles when grasped by the forceps.

FIRST STEP

The first step toward solution of the problem presented by any individual case should be to obtain a duplicate of the particular pin by matching with the roentgenogram. With this duplicate, many hours of practice are advisable, using the open manikin board, the rubber tube, the cadaver and the dog before attempting removal from the patient, especially if a baby.

It is necessary that forceps be tested and perfectly adjusted. There are two forms of rotation forceps used for safety-pins at the clinic; but one, if perfectly adjusted, will do for the case in hand. For the dangling method the jaws should not draw into the cannula so far as to prevent free dangling of the pin. For the rotation in the plane of expansion the jaws should be adjusted to draw well into the cannula. Dull points are preferable for safety-pin work. The Tucker forceps should be tested for grip when traction is made.

At bronchoscopy, the roentgenogram should be placed upside down in the shadow box in the operating room, the right side of the roentgenogram to the operator's right, so that the endoscopist can get an exact conception of the relations of the pointed branch to the patient's anatomy and to the mouth of the tube and forceps, or other instruments, with the patient in the recumbent position. Mental reversal from inspection of an upright roentgenogram is confusing and renders a proper conception of relations impossible.

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* Summary of methods taught at the Graduate School of Medicine, University of Pennsylvania, and at the International Courses, University of Paris (Lemaitre); and demonstrated at the Congress of the Société Belge d'Oto-Laryngologie, July, 1925, and at the Meeting of the Section of Laryngology, British Medical Association, Bath, July, 1925.

There are sixteen fundamental methods of dealing with the safety-pin lodged point upward. Counting minor modifications, a few more could be added. We teach our pupils all of these methods, and advise them to select the method that seems to them most suitable for the case in hand, working with a duplicate and considering the size of the patient's passage and the size, spread and stiffness of spring of the particular pin.

SUMMARY OF METHODS

The sixteen methods are as follows:

1. Buckling the pin into the mouth of the tube; suitable only for pins made of thin wire. Sisterhook or rotation forceps may be used.

2. Breaking. This is difficult and usually unsatisfactory. All manipulation must be between instruments, not between an instrument and the patient's tissues.

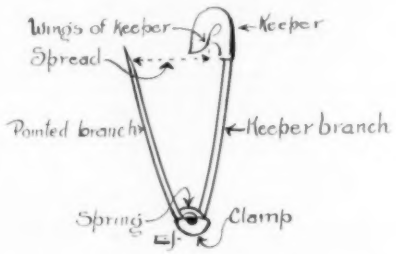

Fig. 1.—The "anatomy" of a safety-pin, giving nomenclature adopted for convenience of consideration of the problems of endoscopic removal. The clamp on the spring coil is not on all pins, but when present it becomes an important factor in some of the author's version methods, especially when the clamp completely "obturates the foramen" in the spring coil, as it does in some pins. The paper of this page represents what is meant by "the plane of expansion" of a safety pin.

3. Dismembering. The keeper can be removed in some pins. The spring clamp, present on some pins, may be removed if desired. Manipulations must be between instruments.

4. Cutting the pin on either branch close to the spring with Casselberry's cutter. This is not difficult to do, and eliminates all difficulty from the spring expansion, reducing the problem to that of two springless foreign bodies, one of them pointed (fig. 2). Cutting tissue must be avoided.

The foregoing four methods, involving mutilation of the pin, are less used by our pupils and ourselves than the following methods of dealing with the pin as it is.

Preferable Methods.—5. Both ends sheathed in the tube mouth. The point is rested against the lip while the keeper is held against the tube mouth (fig. 3), or lip of the laryngoscope, or esophageal speculum. This method is best adapted to pins not widely spread.

6. Version vertical to the plane of expansion. This is adapted to pins that are small in proportion to the passages invaded. Its mechanism

Fig. 2.—Cutting the pin at the place indicated by the dart, *A*, eliminates the troublesome spring action, and converts the problem into a simple one of two tractable foreign bodies.

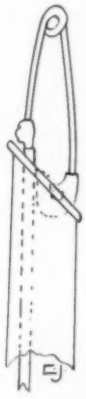

Fig. 3.—Both ends sheathed in tube-mouth. The side-curved, rotation forceps may be used; the maneuver may also be accomplished with forward grasping forceps placed on the keeper; but the best instrument is the single lip Tucker forceps. Sometimes it is easier to get the point in first; at other times, the keeper first. In certain positions of a pin, the maneuver is less difficult with the keeper on the lip of the tube-mouth. More often the point of the pin is rested on the lip as here shown.

is the same as endogastric version. The pin is seized by the spring end and simply tumbled over. The version can be accomplished in the esophagus or bronchus as in the stomach if the pin is small. The rotation forceps are used for this. The presence of a clamp may render it advisable to use method number 7.

7. Version in the plane of expansion. This can be accomplished even with large, stiff pins if my fundamental formula as to manipulation of all pointed foreign bodies, "Advancing points puncture; trailing points do not," is kept constantly in mind (fig. 4). This form of version is also usually done with rotation forceps, and is the most frequently satisfactory of all methods.

8. Version, endogastric. This well known method is adapted to pins of even the largest sizes and stiffest springs. A clamp on the ring, which some pins have, may render this maneuver unsatisfactory. The clamp, if present, will show in the roentgenogram.

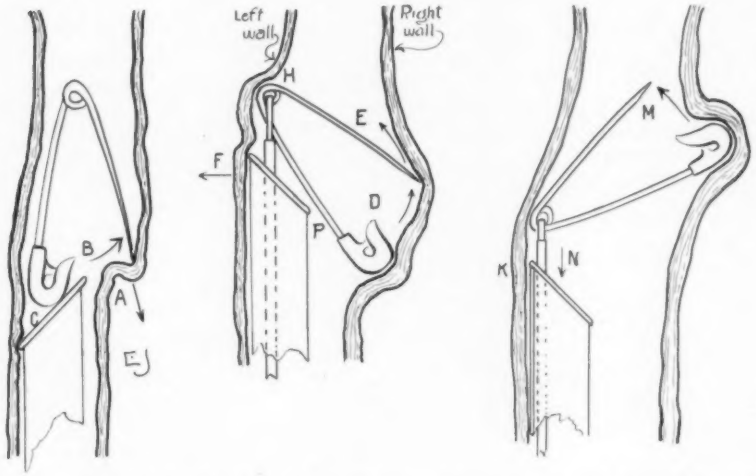

Fig. 4.—Version in the plane of expansion. Advancing the point as indicated by the dart *A*, which would occur if the keeper *C* (always the first part seen) was pulled on, would result in perforating the esophageal wall at *A*. Following the author's dictum: "Advancing points perforate; trailing points do not," the point is made to trail as indicated by the darts *D* and *E*. This is accomplished with the dull pointed rotation forceps. Assuming the point of the pin is to the right, strong pressure is made on the left tissue wall as shown at *F*, overriding the keeper with the tube-mouth, which is passed to the left of the keeper. As soon as the ring of the spring *H* comes into view the dull points of the rotation forceps are closed into it. Still bearing strongly to the left, as at *K*, traction made in the direction of the dart *N* will rotate the pin causing the point to trail as at *M*. Sometimes it is necessary to start the version in the desired direction by a little counterpressure with the tube-mouth *P*. Sometimes the jaws are passed down over the keeper branch, but usually the ring is exposed and grasped as here shown. It is sometimes advantageous to go anterior or posterior to the keeper in getting an exposure of the ring of the spring. This method is sometimes used fluoroscopically. It is a dangerous procedure, exceedingly so unless the double-plane flouroscope be used.

9. Straightening (fig. 5). This is based on my fundamental formula of the trailing point. Its execution has been greatly facilitated by the recent addition of the roller suggested by Dr. Willis F. Manges. The

rotation or the sisterhook forceps are used because of the security of their hold on the keeper.

10. Dangling (fig. 6). A safety-pin seized rigidly, even if caught by the keeper, will cause the point to puncture. If caught by the keeper with rotation forceps in such a way as to dangle freely, the point will not be likely to puncture. This method is adapted to pins whose pointed branch is not longer than the transverse diameter of the invaded esophagus or air passage (D, fig. 6).

11. Point sheathed method. This is adapted to safety-pins of even the largest sizes and stiffest springs. The Gabriel Tucker tack and pin forceps have rendered this manipulation much easier than was the case with side-curved forceps.

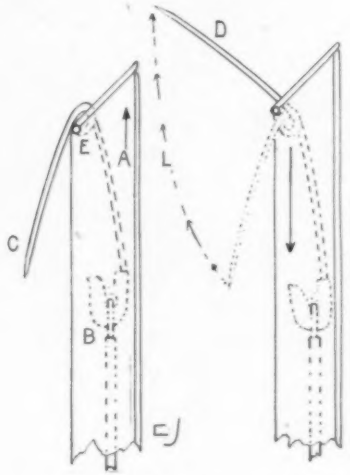

Fig. 5.—Straightening the pin against the tube-mouth, by pushing the tube-mouth down over the pin, as indicated by the dart *A*, the pin being held stationary by the rotation forceps *B*. The point *C*, if traction is carefully avoided, becomes a trailing point in sweeping safely backward to the position *D*. It can then be safely drawn into the tube and removed. At the suggestion of Willis F. Manges, a roller placed in the esophagascope (or bronchoscope) at *E*, facilitates the procedure greatly.

12. Point sheathed with the Mosher trap-door esophagoscope, or bronchoscope. This is adapted to the largest and the stiffest springed pins. The Tucker tack and pin forceps are essential, and the utmost caution is necessary not to become entangled with the pin or to pull upon it.

13. Closure by manipulation with forceps and tube-mouth. This can be accomplished in only a few cases. It is excellent manual practice.

14. Closure by the erecting ring closer. This is adapted to any size of pin, provided a ring of precisely the right size be used.

15. Closure by the Arrowsmith closer. A pin of any size can be closed, provided a closer of proper size be selected. If lack of fixity of the pin gives trouble in manikin board practice, the Clerf-Arrowsmith closer should be tried. To close the pin and have the point held by the keeper, it is necessary that the wings of the keeper be not bent in.

16. Seizure by any part seen. Very small pins, whose extreme measurements in every direction do not exceed the diameter of the passage invaded, may be thus seized, though version in such cases would be easy. In cases of large pins, this method is justifiable only in the larynx, hypopharynx and above this level. It is justifiable in these high locations only because trauma there is a less serious matter than at the

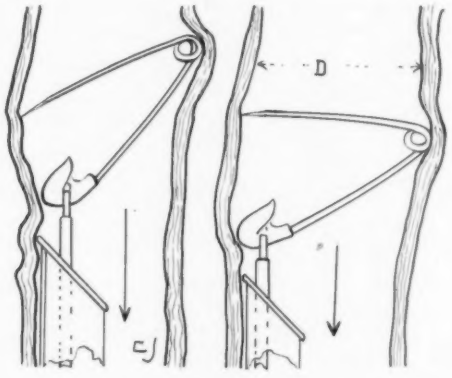

Fig. 6.—The "dangling" method. The safety-pin dangling loosely in the "dangling" rotation forceps turns crosswise with little tendency of the point to perforate the tissues provided the entire length of the pointed branch is not greater than the diameter *D* of the invaded passages. If held rigidly, as with ordinary forceps, the point of the pin might perforate.

lower regions to which the pin might descend if dislodged in manipulative efforts to find the best point of seizure. The endoscopist with little experience is especially urged to use this method in these high locations.

COMMENT

Each of the foregoing methods is especially suited for the kinds of pins mentioned. It is necessary for the endoscopist to practice all of them until manual dexterity develops through "nerve cell habit." Then when a patient comes under his care, he can, by working with a duplicate of the particular pin and considering his confidence in himself and his organization, the age and condition of the patient, and all other terms of the equation, decide which method or methods he will use. "Do what you deem best for your patient" is the only rule to which there are, and can be, no exceptions.

LABYRINTHINE TONUS AND VARIATIONS IN INTRACRANIAL PRESSURE

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In 1892, Ewald found that an abnormal atony developed in all the striated muscles of the body after removal of the labyrinths. Several explanations have been offered for the production of this labyrinthine tonus. All agree that it must be due to afferent impulses initiated in the vestibular nerve end-organs, the maculae acusticae and the cristae ampullares. Movement of the endolymph at these nerve terminations can conceivably produce these nerve currents.

Nerve fibers can be stimulated only at regular intervals. The period of stimulation is immediately followed by a refractory phase (from 0.002 to 0.003 of a second), in which the nerve cannot be stimulated. A stimulant must, therefore, be intermittent.

It is difficult to conceive of the mere position of the labyrinths in relation to gravitation as being sufficient to account for labyrinthine tonus. Whatever contribution to the afferent impulses from this source must come from the macular otolithic membranes, since by their greater weight they can produce more tension or pressure in different positions of the head than the membranous cupulas of the cristae.

Maxwell [1] has demonstrated that the macular membranes produce greater nerve currents when suspended or displaced than when pressing down over the hair cells of the maculae.

In 1915, Edmund P. Fowler [2] suggested that differences of temperature in the crests of the semicircular canals as compared to their ampullar ends, might induce currents of the endolymph.

These differences of temperature would seem to be too slight to produce sufficient currents.

In 1923, Shambaugh [3] advanced the idea that to-and-fro movements of the endolymph were caused by pulsations of the arterial supply of the labyrinth, these in turn irritating the cristae and maculae.

This explanation does not seem adequate. The arterioles of the labyrinth are either in bony channels, such as the modiolus or lamina spiralis ossea, or are placed far from the membranous labyrinth under the endosteum. They approach the endothelium of the membranous labyrinth as capillaries. Moreover, they are minute when compared to the size of the labyrinthine cavities, and it is difficult to think that any

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1. Maxwell, S. S.: Tr. Am. Laryngol., Rhinol. & Otol. Soc. (Feb. 23) 1922. The Labyrinth and Equilibrium, Philadelphia, W. B. Lippincott Company, 1923, p. 98.

2. Fowler, Edmund Prince: The Origin of Labyrinthine Rest-Tone, J. A. M. A. **64**:118 (Jan. 9) 1915.

3. Shambaugh, George E. Structure and Function of the Crista Ampullaris, Ann. Otol., Rhinol. & Laryngol. **32**:443 (June) 1923.

currents could be set in motion when the capillary pulsations occur throughout the labyrinth at practically the same moment. There might be slight changes of pressure, but no distinct currents of the endolymph.

THE INTERNAL EAR

The following seems a more logical explanation of labyrinthine tonus production. The cavity of the internal ear is divided into two series of cavities, the perilymphatic and the endolymphatic. The former is composed of the osseous, vestibule, semicircular canals, scala vestibuli, helicotrema, scala tympani and the aqueductus cochleae, all lined with endosteum. This cavity contains perilymph, and communicates directly with the subarachnoid space through the aqueductus cochleae and therefore with the cerebrospinal fluid, with which it is identical.

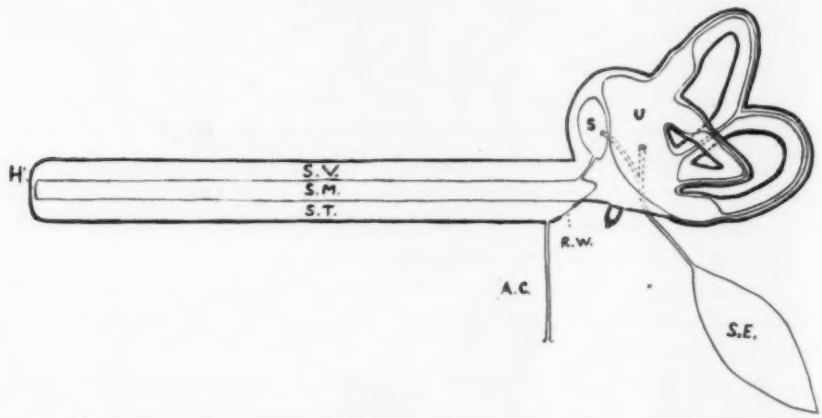

Fig. 1.—Schematic presentation of the relations of the membranous labyrinth, cochlea included, representing the coils of the cochlea straightened out: *S.*, saccule; *U.*, utriculus; *S.E.*, saccus endolymphaticus; *A.C.*, aqueductus cochlea; *R.W.*, round window (fenestra cochleae); *S.T.*, scala tympani; *S.V.*, scala vestibuli; *H.*, heliocotrema; *S.M.*, scala media ductus cochlearis).

The endolymphatic series of cavities constitute the membranous labyrinth. It consists of the membranous semicircular canals, the utricle, the ductus utriculo-saccularis, the ductus and saccus endolymphaticus, the saccule, the ductus reuniens and the ductus cochlearis.

The saccus endolymphaticus lies in the posterior cranial fossa, between two layers of the dura, on the posterior surface of the petrous pyramid, between a point half way between the internal acoustic meatus and the sigmoid sinus. According to Portmann, its dimensions are: vertical diameter, from 1.5 to 2 cm.; transverse diameter, 1 cm. and thickness from 0.5 to 2 mm. The dimensions of the sacculus, according to Cunningham, are 3 by 2 mm.

If we accept these figures as correct, the saccus endolymphaticus is five to seven times as long and five times as broad as the sacculus—quite

different from the usual illustrations in the textbooks. It, therefore, covers a considerable part of the anterior wall of the posterior fossa.

The saccus endolymphaticus at its upper internal end contracts to form a tube, the ductus endolymphaticus, which passes through the aqueductus vestibuli and terminates in the vestibule in the saccule, in close proximity to the macula acustica. The dimensions of the ductus endolymphaticus are: length, from 8 to 10 mm., diameter about 0.2 mm.

Another small canal, the ductus utriculosaccularis, branches from the ductus endolymphaticus just before the latter enters the saccule, and ends in the utricle opposite the crus commune of the vertical membranous semicircular canals, just below the macula acustica.

Moreover, the maculae and the cristae occupy a large part of their respective containing cavities. The macula acustica of the saccule is 1.5 mm. long as compared to 3 mm., the longest diameter of the saccule. The macula acustica of the utricle is 3 mm. in length and 2.3 mm. in breadth (Cunningham) as compared to 5 to 6 mm., the greatest diameter of the utricle.

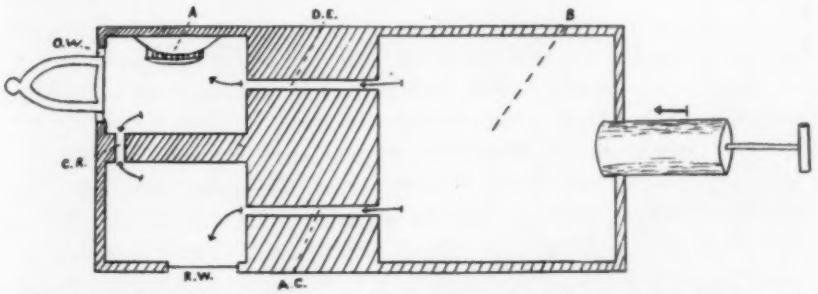

Fig. 2.—Schematic presentation of the spaces of the labyrinth and the cranial cavity: *O.W.*, oval window (fenestra vestibulum), stapes in situ opening into the common vestibular cavity; *A.*, end-organs of the vestibule, macula acustica; *D.E.*, ductus endolymphaticus leading from the vestibule and the *B.*, cranial cavity; *R. W.*, round window (fenestra rotunda) located between the tympanum and the scala vestibuli of the cochleae; *A.C.*, aqueductus cochleae, the communication between the scala vestibuli and the cranial cavity.

The ridges, together with the cupulae of the cristae ampullares, extend to as much as two thirds of the diameter of the membranous ampullae. Therefore, the slightest movement of the endolymph will cause a corresponding movement of the membranes attached to the hair cells of the vestibular nerve end-organs. The possible movement of the cupulae of the cristae, according to Bárány, is only 0.01 mm., or less.

From the lower part of the saccule, a small short canal, the ductus reuniens, length about 1 mm., diameter 0.22 mm. (Politzer), passes from the saccule into the ductus cochlearis a short distance anterior to its closed end in the vestibule.

The membranous labyrinth is a closed cavity containing endolymph. In the labyrinth it is largely surrounded by perilymph; in the posterior

cranial fossa, it is subject to the pressure changes in the cerebrospinal fluid.

The perilymphatic cavity communicates with the subarachnoid space through a small canal, the aqueductus cochleae, which opens into the scala tympani close to the round window. The dimensions of the aqueductus cochleae are similar to those of the ductus endolymphaticus, namely, length, from 10 to 12 mm.; diameter, about 0.2 mm.

CEREBROSPINAL FLUID PRESSURE

The pressure of the cerebrospinal fluid is therefore transmitted to the perilymphatic cavity through this aqueduct, and throughout the membranous labyrinth through the pressure on the saccus endolymphaticus. The cerebrospinal fluid pressure is constantly changing. The systole of the heart produces, in round numbers, 72 slight increases of pressure a minute. The expiratory phases of respiration produce increases of pressure sixteen times a minute. The Traube-Herring vasomotor waves in the arterial circulation produce slight changes from two to six times a minute. All muscular actions, cough, changes of position, etc., produce marked rises in pressure. The number of pressure changes a minute are thus from 90 upward, or one in at least every two thirds of a second. These variations in pressure are transmitted through the two channels into the internal ear.

The currents passing through the aqueductus cochleae enter the scala tympani near the membrana secundaria of the round window. This membrane yields to the pressure somewhat, so that no considerable current passes up to the helicotrema, or through the scala vestibuli to the vestibule. At the vestibule it is met by the current initiated by the pressure on the saccus endolymphaticus, and is thus neutralized.

On the other hand, the current from the ductus endolymphaticus is led directly to the vicinity of the maculae acusticae and the cristae ampullares. This current is possible through the outward yielding of the stapes to the pressure transmitted through the cisterna perilymphaticus from the adjoining membranous labyrinth. These currents are undoubtedly minute, but sufficient to affect slightly the hair cells of the vestibular nerve endings.

As the currents pass simultaneously and equally into each labyrinth, the lengths and calibers of the two tubes being approximately equal, the effect on the one is counterbalanced by that on the other, in the same way as in the use of the galvanic current or the caloric test, applied to both ears at the same time.

In conclusion, intermittent variations in intracranial pressure transmitted directly to the vestibular nerve end-organs, would, therefore, seem to be sufficient to account for the production of labyrinthine tonus.

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MASTOIDITIS WITHOUT APPARENT OTITIS MEDIA*

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The infrequent occurrence of mastoiditis without apparent otitis media has prompted the following report of two cases. They are indeed interesting, and I hope that by adding to those already reported there may be a better understanding of this unusual type of infection.

ETIOLOGY AND SYMPTOMS

The term primary mastoiditis, as it has been used to designate this type of infection, is misleading, since it implies an involvement primarily in the mastoid and not secondary to an infection that has passed through the eustachian tube and middle ear. It is generally agreed that the infection enters the mastoid by this route. Involvement of the middle ear may produce no symptoms or signs. The infection spreads to the mastoid through the aditus ad antrum, and if this passage is small, it becomes occluded. The infection in the middle ear subsides because of drainage through the eustachian tube, and that in the mastoid continues, to the destruction of the cellular structure.

Mastoiditis without apparent otitis media should not be confused with latent suppurative otitis media. In these cases there is deafness and sometimes pain, but no spontaneous discharge of pus. The tympanic membrane is without luster, full and sometimes markedly bulging, and paracentesis is always followed by the discharge of pus. *Streptococcus mucosus* is particularly prone to cause this type of infection. Mastoid involvement and other complications may or may not be present, whereas in the cases of mastoiditis without apparent otitis media, paracentesis is never followed by the discharge of pus.

In the absence of middle ear symptoms, the advent of the mastoiditis may be marked by local and constitutional reactions in the form of swelling over the mastoid process, fever, leukocytosis and definite destruction of the cellular structure, as noted by the roentgen-ray plates.

REVIEW OF THE LITERATURE

In 1923, Hempstead [1] reviewed the literature on this subject, and reported three cases which were selected from a series of 500 cases of mastoiditis with involvement of the middle ear. In addition to these, fifty cases had been reported previously. The description of some of

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1. Hempstead, B. E.: Mastoiditis Without Apparent Involvement of the Middle Ear, J. A. M. A. **81**:1266-1268 (Oct. 13) 1923.

them was so vague that they could not be classified definitely in this group. Since Hempstead's review, seven cases have been reported.

Heggie and Knauer [2] reported two cases in which it was particularly noted that the aditus ad antrum was very narrow.

Wagers [3] reported the case of an infant, aged 7 months, in whom there was a subperisoteal abscess, with coalescence of the mastoid cells. The drum had a normal appearance and paracentesis was not followed by the discharge of pus.

Diehl [4] reported a case in which the drum was apparently normal, but it was not stated whether paracentesis had been done.

Kopetzky and Almour [5] recently reported three cases in which there was a marked coalescence of the mastoid cells and an erosion of the inner table at some point. One of the patients had earache and one a sense of fulness in the ear which persisted for a week, but there were no changes in the drum.

INVOLVEMENT AND REACTION

In attempting to explain this unusual type of involvement, it is necessary to assume that certain processes take place. While we are unable to submit definite proof, there are certain explanations which seem plausible.

We know that otitis media and mastoiditis practically always occur as complications of an acute bacterial infection of the nose and throat. There is every reason to believe that this infection passes through the eustachian tube to the middle ear and mastoid, in which an inflammatory process ensues. The eustachian tube, the middle ear along the anterior half of its floor and the region of the tubal orifice are lined with ciliated epithelium, which tends to propel invading bacteria into the nasopharynx. When this barrier to invasion is overcome, either by lowered tissue resistance, inflammatory reaction or virulent bacteria, the infection enters the middle ear, and since most of this cavity is lined with squamous epithelium there is very little protective mechanism to prevent the spread of infection to the mastoid cells.

We see cases of otitis media in which there is only the slightest inflammatory reaction in the drum, which undergoes resolution without producing any further pathologic change. In these cases the eustachian

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2. Heggie, N. M., and Knauer, W. J.: Mastoiditis Without Apparent Involvement of the Middle Ear, J. A. M. A. **84**:1044 (March 29) 1924.

3. Wagers, A. J.: Acute Mastoiditis, Apparently Primary, in an Infant Seven Months of Age, Laryngoscope **34**:453 (June) 1924.

4. Diehl, J. E.: Report of a Case of Mastoiditis, Epidural Abscess with Apparently No Middle Ear Involvement, Virginia M. Month. **51**:223 (July) 1924.

5. Kopetzky, S. J., and Almour, R. A.: Report of Three Cases of Primary Acute Mastoiditis, Laryngoscope **35**:774-777 (Oct.) 1925

tube probably acts as a means of drainage. We also see cases in which the accumulation of exudate in the middle ear progresses to the point at which paracentesis or spontaneous rupture of the drum is necessary for drainage. When this is established, even though there is also mastoid involvement, the infective process may undergo resolution. Sometimes, on the other hand, in spite of the drainage, there is a profuse discharge, coming mostly from the mastoid cells, which does not undergo resolution. In these cases it is necessary to open the mastoid. Now if we suppose that the aditus ad antrum becomes closed off, the suppurative process in the mastoid may progress while it subsides in the middle ear. That is what occurs in latent otitis media. In mastoiditis without apparent otitis media, there is every reason to believe that in passing through the middle ear the bacteria do not produce any demonstrable pathology in this cavity; or, if they do, it is so slight that resolution immediately occurs. If we had the opportunity to observe these cases from the very onset, the probability is that some minor changes in the drum would be observed at some time in the course of the disease. It seems plausible to assume that if the aditus ad antrum is small or becomes obstructed by inflammatory involvement, the mastoid and middle ear become completely disconnected. The inflammatory process progresses in the mastoid without any demonstrable pathology existing in the middle ear.

In Hempstead's three cases, as well as in the two reported here, it was particularly noted that the aditus ad antrum was very narrow and the mastoid antrum was extremely small. The cells were poorly developed, especially in the region of the antrum. Under these conditions it is easy to understand how communication between the middle ear and the mastoid may be obliterated.

If we were able to obtain an authentic history from infancy, we might find that in most of these cases there had previously been otitis media and mastoiditis which had undergone resolution, and that as a result of this resolution a sclerosis of the mastoid cells ensued, thus accounting for the existence of a small antrum and aditus. On the other hand, this anatomic anomaly may be developmental.

It would seem that this type of mastoid disease is dependent on the anatomic peculiarities which exist in the mastoid process, rather than due to some specific organism.

The marked destruction of the cellular structure of the mastoid could be accounted for on the basis of pressure necrosis as well as of the activity of the bacterial infection. The danger in cases of this type lies in the failure to recognize and estimate the mastoid involvement. The marked destruction of bone increases the possibility of subperiosteal abscess, sinus involvement and intracranial complications.

REPORT OF CASES

CASE 1.—*History.*—P. P., a woman, aged 45, was first seen on May 25, 1925, because of painful swelling of the right mastoid and upper cervical regions. Three months previously, she had had a head cold. One week after the onset an ache developed in the right ear, with pain over the mastoid. The earache subsided within an hour and there was no discharge from the drum. The pain over the mastoid continued almost constantly for about three weeks, then the symptoms subsided, with only occasional pain. Two weeks before examination, the pain became more severe, and swelling and redness appeared over the mastoid. This gradually increased. Up to the the time of examination there had been no discharge from the middle ear.

Examination.—The hearing was normal. Findings in the nose, nasopharynx, throat and both tympanic membranes were negative. There was a marked swelling with redness and edema over the entire mastoid, extending a short distance below the tip. Roentgenograms of the mastoids showed a structure of mixed cells, mostly of the pneumatic type; small cells in the antrum region, and large cells along the posterior portion of the process. The extreme tip showed very few cells. The knee of the lateral sinus came within 0.5 cm. of the posterior wall of the auditory canal. On the left side the cells were clear and showed no signs of inflammation. On the right side, however, the entire area was obscured and the cell structure could not be made out. A large irregular rarefied area was present above the tip. There was definite evidence of bone destruction. The leukocytes numbered 10,000. The temperature was normal.

Operation.—The usual mastoid incision was made in the postauricular sulcus. About 1 ounce of pus was found in a subperiosteal abscess. The cortex had ruptured at a point just below and posterior to the spine of Henle. The mastoid cells were coalescent, with pus and granulations throughout. The cells in the region of the antrum were very small and the bone was quite dense. The antrum itself was about the size of a pea and the aditus ad antrum was extremely narrow, not more than one half of the usual diameter.

The cells in the tip were moderately large and of the pneumatic type. The mastoid cells were thoroughly exenterated and the margins of the excavation were beveled to make the cavity shallow. The lateral sinus was normal but lay well forward. Bacteriologic examination revealed *Streptococcus hemolyticus.* The drum was incised but no pus was obtained. The patient was dismissed two weeks after the operation with the wound healed.

Comment.—At the onset of the illness and during the acute head cold, there was undoubtedly a mild otitis media present. The infection spread to the mastoid, and the inflammation coincident with the infection sealed off the aditus ad antrum. It was particularly noteworthy during the operation that the antrum was very small and the aditus extremely narrow. The otitis media apparently subsided early and there was not sufficient exudation to produce a spontaneous rupture of the drum. At the time of the examination the drums were normal in every respect.

CASE 2.—*History.*—C. B., a girl, aged 11, was seen on April 6, 1925, on account of painful swelling over the right mastoid, which had been present for about two weeks. Five weeks previously the patient had an acute cold which was compliated by an earache on the right side. The earache subsided within a few hours, then mastoid pain began. The patient was seen by a physician who pronounced the ears normal. For about three weeks, the pains continued off and on with increasing severity, and swelling, redness and edema appeared over the mastoid. She had some stiffness in the right side of the neck for about two weeks. The child had some elevation of temperature but no chills, vomited two or three times a few days before examination. There had been no discharge from the ear at any time.

Examination.—Nose, nasopharynx, tonsils and the general physical condition were negative. Both ear drums were normal in appearance, as was also the

hearing. Examination of the right mastoid showed redness, edema, swelling and tenderness over the entire process. There was marked swelling posterior to the tip and extending back over the occiput. The temperature was 99.2 F.; leukocytes, 10,000.

Roentgenograms showed the mastoid cells on the left side to be normal. Those on the right side were not clearly outlined, with indefinite cavity formation near the tip. The knee of the lateral sinus was located about 0.5 cm. posterior to the auditory canal. Examination on the neck on the right side showed some swelling and tenderness below the tip of the mastoid, extending downward for a distance of about 8 cm. along the sternomastoid, and the lymph glands were enlarged along its entire course. The patient held the neck somewhat rigid and there was a tendency to deviate the head to the right side.

Operation.—Marked edema of the subcutaneous tissue and subperiosteal abscess posterior to the tip were seen. The cortex had perforated along the extreme posterior edge. There was marked destruction of the cells, with a great deal of pus and granulation tissue. The antrum was small and the bone was extremely dense in this region. The aditus ad antrum was very narrow. The lateral sinus lay uncovered for a distance of about 3 cm. Just below the knee there was an opening about 1 cm. in diameter from which pure pus discharged. Above and below this the vein was firmly thrombosed. The sinus was uncovered upward to a point about 2 cm. above the knee, where a healthy vein and free bleeding were encountered. The vein was ablated at this point. There was no free bleeding from the lower end. A small wick drain was inserted. The jugular vein was ligated just below the facial vein, which was also tied off. The tympanic membrane was incised but pus was not obtained. The mastoid was completely healed in three weeks. Culture revealed *Streptococcus hemolyticus.*

Comment.—This patient undoubtedly had otitis media during the cold at the time of onset. The infection spread to the mastoid but subsided in the middle ear. At the operation, the mastoid antrum was found to be very small and the aditus ad antrum extremely narrow. This anatomic peculiarity probably accounts for the fact that the mastoid cavity became sealed off from the middle ear. At no time was there any discharge from the drum. The sinus thrombosis found at the operation was suspected, as the stiffness of the neck and the tendency to deviate the head to the right were suggestive of its involvement. There was no definite history of sepsis.

DIATHERMIC STUDIES ON THE EYE AND EAR

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AND
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COMPARATIVE STUDIES OF HEAT PRODUCING AGENTS

The purpose of these experiments was to establish the relative penetration value on eyes and ears of the heat producing agents commonly used. Hot wet dressings, lamps of various sorts and diathermy were studied in this connection, to determine the comparative value of conductive, convective and conversive heat. The tolerance of the skin and the subcutaneous tissues for heat and diathermy were determined clinically, and the limits noted were used as guides for animal experimentation.

Eye Experiments.—Anesthetized dogs were used for the following experiments:

1. Through an incision 1 cm. lateral to the external canthus, a pocket was made to the fundus of the orbit by blunt scissor dissection and an electrical, or mercurial, thermometer was inserted deeply and fixed with ligatures, etc.

2. Through another similar skin incision, the equator of the globe was exposed and a small incision was made in the sclera. Through this, a heat indicator was thrust into the vitreous and adequately anchored.

3. A thermometer was placed into the conjunctival sac and the lids were sewed over it.

4. A thermometer was placed on the surface of the lids.

5. A thermometer was placed in the rectum.

The various heat producing agents were applied and the temperatures were noted at the start and at regular intervals.

Wet dressings were kept hot by frequent changing and by combining their use with a carbon filament lamp. The "infra-red" lamp was used at a distance of 3 feet from the part. Diathermy was administered by applying a small, well soaked metal electrode over the closed lids (previously shaved), and a larger metal electrode on the under side of the opposite jaw which was previously shaved. The current was always turned on, gradually increased, and allowed to flow for ten minutes before temperatures were taken.

Each table here gives only the important figures in an experiment and is, therefore, only a condensation of a complete study. All figures given in a table were recorded in a single experiment on the same dog, with the same thermometers and under the same circumstances.

Ear Experiment.—A similar study was undertaken on the mastoid region:

1. The skin behind one ear was shaved and a metal electrode 1 by 1 inch was applied firmly.

2. The skin in front of the other ear was similarly prepared, and a larger metal electrode 1½ by 3½ inches was fastened to it.

3. A midline incision was made through the skin of the top of the head, and a small pocket under the skin was produced by blunt dissection to reach as far as the small electrode.

4. A similar pocket was also made under the thick muscle which lies beneath the skin.

TABLE 1.—*Eye Experiment No. 1*

Time	Start	Diathermy High Voltage, 400 Milliamperes Temps. Measured Outside of Line of Current		Carbon Filament Lamp at 12 Inches and Hot Wet Dressing at 136 F.
Under lid	96	112	S	108.5
In vitreous	97.5	110	T	105.0
In orbit	98.2	105	O	101.0
Rectal	98.8	100.5	P	99.4
Surface	90	111.6		134.6

TABLE 2.—*Eye Experiment No. 2*

Time	Start	Incandescent Lamp After 8 Minutes		Diathermy Low Voltage, 250 Milliamperes, Temperatures Measured in Line of Current After 10 Minutes
Under lid	94	107	S	104.7
In vitreous	94.5	102.5	T	103.0
In orbit	96.5	99.5	O	102.4
Rectal	97.5	98.7	P	99.5
Surface	84.2	125.6		100.0

5. Into these pockets thermometers were placed and fastened.

6. A trephine opening was then made and a thermometer placed in the brain substance.

7. A fourth thermometer was introduced between the skull and the dura near the small electrode.

8. Rectal temperature was also taken.

When diathermy was not used, the electrodes were removed but nothing else was disturbed.

The most obvious deduction from these experiments is that diathermy generates heat in deep tissues with less heat on the surface of the skin as compared with lamps and hot dressings. The important fact is that to obtain a substantial rise in temperature in deeper tissues with all agents excepting diathermy, the skin temperature must be raised to

a degree practically beyond human endurance. It is also to be noted that the heat with diathermy is localized in the eye region and the temperature is always under immediate control, whereas with lamps the whole head is heated and the temperature can be changed only by moving the lamp or the head.

DEEP EFFECTS OF DIATHERMY ABOUT THE TEMPORAL BONE

The object of this study was to estimate the heat generation effect of diathermy in the mastoid region on living and dead tissue, and also to estimate the comparative efficiency of two methods of administration, namely, by way of the auditory canals and by way of the mastoid region.

Experiment 1.—Electrodes were placed in the external auditory meatus of a dog, after most of the pinnae had been removed. By

TABLE 3.—*Ear Experiment No. 1*

Time	Diathermy High Voltage After 10 Min.	Diathermy Low Voltage After 10 Min.	Infra-Red After 5 Min.	Infra-Red 5 Min. Later
Under skin	108.2	108.2	108.6	114.5
Under muscle	104.2	105	101	102.2
In brain	101.2	102	100.6	101.5
Rectal	98.8	99.9	100.4	100.8
Surface	110.0	110	121	134.0

TABLE 4.—*Ear Experiment No. 3*

	D'Arsonval Current					
	500 Milliamperes			750 Milliamperes		Animal Still Alive 20 Min.
Time	Start	5 Min.	10 Min.	5 Min.	Stop	Later
Under skin	95	98.7	100.6	101.8		94.6
Under muscle	98.7	104.6	104.2	106		99
Under bone	98.3	100	100.6	101.2		99
In brain	100	100	100	100.2		100
Rectal	100	100.8	100.8	100		100.8

means of a thermometer, placed beneath the skin under the electrodes, another under the muscle and one under the skull in as close proximity to the electrode as possible, the temperature was determined, after passing a diathermy current of from 400 to 500 milliamperes for from five to ten minutes. The result was as follows: an increase in temperature under the skin, but only a very slight rise under the bone and under the muscle.

Experiment 2.—A mesh electrode was placed on the shaven skin just behind the ear, and a larger (indifferent) electrode on the shaven jaw of the opposite side. A thermometer was introduced into the middle ear, through the drum membrane. With 400 milliamperes d'Arsonval current, a rise in temperature of 2 to 3 degrees was noted within five minutes.

Experiments 3 and 4.—With the electrodes as in No. 2, a thermometer was placed under the skin, another between the muscle and skull, and still another beneath the skull on the dura. A fourth thermometer was inserted into the brain substance and a fifth into the rectum. The tables give the results of these experiments.

Experiment 5.—This was the same as experiments 3 and 4, repeated on a dead animal.

From the standpoint of clinical application, these experiments are significant because they lead to several definite conclusions.

TABLE 5.—*Ear Experiment No. 4*

	D'Arsonval Current						Animal Killed	
	500 Milliamperes			750 Milliamperes				
Time	Start	5 Min.	10 Min.	5 Min.	10 Min.	Stop	5 Min. Later	15 Min. Later
Under skin	92	95	96	102	100		92	90
Under muscle	97.5	100.8	102	106.2	107		105	103
Under bone	97.5	98.5	99	100	101.5		101.5	101.8
In brain	98.8	99.2	99.3	100.4	101		101.5	101.3
Rectal	98.8	98.8	98.8	98.8	98.8		98.8	97.0
Electrode	96	97	99.5	99.5	99.5		96	93.2

TABLE 6.—*Ear Experiment No. 5 (Animal Dead)*

	D'Arsonval Current				
	500 Milliamperes		750 Milliamperes		
Time	15 Min. Later	5 Min.	10 Min.	Stop	5 Min. Later
Under skin	90	103.5	109.8		100
Under muscle	103	110	113.0		112.5
Under bone	101.8	103.5	105.5		106.2
In brain	101.3	103.0	104.5		104.8
Rectal	97.0	97	.....		.....
Electrode	93.2	114.8	117.0		.....

COMMENT

1. Diathermy introduced by way of the ear canals does not reach the middle and inner ears with adequate intensity.

2. Diathermy introduced by an active electrode behind the external ear, with the indifferent electrode anterior to the ear on the opposite side, produces a substantial rise in temperature in the region of the ear from the middle ear to the inner surface of the skull.

3. With diathermy, the maximum temperature is reached only after about ten minutes' application.

4. With d'Arsonval currents of 300 to 500 milliamperes, there is practically no effect on the brain nor on the body temperature.

5. The highest temperature obtained was between the muscle and bone, where the increase was usually greatest.

6. In living tissue there is a return to normal temperature within twenty minutes; in dead tissue the change is much more gradual (up to two hours).

7. Under the identical conditions, a d'Arsonval current produces higher temperatures in dead than in living tissues.

RELATIVE HEAT VALUES OF LOW, MEDIUM AND HIGH FREQUENCY CURRENTS OF LOW AND HIGH VOLTAGE

This study was undertaken to determine the temperature of deeper tissues produced by diathermy currents of high and low voltage and of different frequencies of oscillation.

The apparatus used was specially prepared for this investigation by the H. G. Fischer Company of Chicago. Provision was made for a

TABLE 7.—*Low Frequency (About One Million)*

	Low Frequency (About 1 Million)							
	Experiment 1		Experiment 2		Experiment 3		Experiment 4	
Voltage	High	Low	High	Low	High	Low	High	Low
Under skin	102	104.6	108.2	108.2	99.2	99	99.5	100.8
Under muscle	98.4	101.2	104.2	105	98	97.2	97.5	98.2
In brain	98.4	99.4	101.2	10.2	97.5	97.3	97.5	98.1
Rectal	97.2	98	98.8	99.9	96.8	96.5	96.8	96.8
Difference between skin and muscle temperatures	3.6	3.4	4.0	3.2	1.2	1.8	2.0	2.6

	Higher Frequency (About 2½ Million) Experiment 5		High Frequency (About 3½ Million) Experiment 6	
Voltage	High	Low	High	Low
Under skin	128	122.5	105.5	103.6
Under muscle	121	117	98.8	98.6
In brain	92.4	102.2	97.6	97.5
Rectum	98.6	99	97.0	96.9
Difference between skin and muscle temperatures	7.0	5.5	6.7	5.0

change of voltage from 600 to 50,000. A special arrangement made possible a gradual change of the frequency of oscillation from 1½ millions to 3½ millions per second.

The animal was prepared for this experiment in exactly the same manner as for experiments referred to in another study.[1]

Table 7 gives the temperatures produced by high and low voltage currents, with the amperage the same for both voltages. The amperage, however, was different in each experiment.

The most significant figures are those showing the difference in temperature between the skin and muscle, because these indicate the penetration of heat. In other words, the more nearly the muscle temperature approaches the skin temperature, the greater the efficiency of the system to heat deep tissues.

1. Hollender, A. R., and Cottle, M. H.: Clinical and Experimental Study with Some Physical Agents in Partial Deafness, Arch. Otolaryng. **3**:338 (April) 1926.

CONCLUSIONS

From these experiments we draw the following important conclusions:

1. Low voltage currents are more effective in producing deep heat than high voltage currents, if the frequency and amperage are constant (experiments 1 to 6).

2. Low frequency currents are more effective than high frequency currents for producing deep heat if the voltage and amperage are constant (compare experiments 1 and 6).

3. High voltage and high frequency currents produce greater superficial heat effects than low voltage and low frequency currents, if the amperage is the same (experiments 1 to 6).

ACUTE MASTOIDITIS, LATERAL SINUS THROMBOSIS AND PYEMIA

REPORT OF A CASE, WITH OPERATION AND RECOVERY *

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CASE REPORT

P. F., a girl, aged 7 years, was admitted to the Beth Moses Hospital on July 27, 1924, her chief complaint being persistent fever, pain in the right ear and severe headache.

Previous Personal History.—The patient had the usual diseases of childhood. Two years previously she had an attack of acute otitis media in the right ear, from which she recovered without any complications. Several months later her tonsils and adenoids were removed. Otherwise, she had had comparatively good health.

History of Present Illness.—Four days prior to admission to the hospital, the child was seized with severe pain in the right ear. Two days after, the drum ruptured spontaneously, but no relief from pain was experienced. On the sixth day of illness she was seen by an otologist, at which time the drum was freely incised. Following incision, there was a profuse discharge from the ear for a little over a week; this gradually subsided until, three days prior to my seeing the child, it ceased entirely. On July 25, the patient had a severe chill followed by a rise in temperature to 105 F., and complained of severe headache. The next morning the temperature dropped to 99 F. and the child was more comfortable; the same evening the temperature again rose. She was referred to me by Dr. S. Wolf on the evening of July 27.

Examination.—The child was pale but appeared well nourished and not acutely ill. The temperature was 100 F.; pulse, 104; respirations, 28. The attending physician found the heart and lungs normal and a slightly palpable spleen. Ear examination disclosed a resolving drum, a small perforation in the anterior inferior quadrant, with some moisture in the external auditory canal. Sagging of the posterior superior canal wall was absent. Hearing was markedly diminished. There was no tenderness over the mastoid except to a slight degree over the tip. There were no palpable cervical glands. I immediately suggested hospitalization, and diagnosed the condition as acute mastoiditis with sinus thrombosis.

Course.—On the morning of July 28, the child's temperature dropped abruptly to 98 F. Roentgenograms of both mastoids were made. Blood culture was taken and reported subsequently. Spinal puncture was done and 10 cc. of fluid was withdrawn under no increased pressure; the first 5 cc. was cloudy but the rest was clear. A further report is to follow. The blood count showed a hemoglobin of 60 per cent; red blood cells, 4,200,000; white blood cells, 23,000 with 84 per cent polymorphonuclears. The patient's general condition was good. A smear taken from the ear showed several organisms, the predominating one being the streptococcus.

On the evening of July 28, the temperature again rose abruptly to 105 F., which elevation was preceded by a distinct chill. In the morning the temperature fell as usual. The throat culture was reported negative. The urinalysis was negative except for a slight trace of albumin. Spinal fluid from the puncture of the previous day showed no

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* Read before the Section on Otolaryngology, Kings County Medical Society, Oct. 14, 1925.

organisms, with a cell count of 6 cells per cubic millimeter. Blood culture was reported negative for twenty-four hours, and another specimen was taken.

The pediatric summary of the heart and lungs was negative; the spleen was enlarged. The ophthalmologic examination was negative. Roentgenograms of both mastoids revealed, according to the roentgenologist, a sclerosing process of both mastoids, more so on the right, with no evidence of necrosis visible.

With all the data at hand, that is, a definite history of a suppurative ear condition and a characteristic temperature curve with distinct chills, and having ruled out fairly definitely all possible sources for the pyrexia, even in the face of a negative blood culture, I felt quite certain that I was dealing with a sinus infection and advised operation. This was performed on July 30.

Operation.—On opening the mastoid I found the following pathologic changes: The mastoid was of moderate size with few cells. Except in the region of the tip, in which there was considerable softening, the cells were not broken down. Free pus and diseased granulations were encountered only in the latter area. After carefully clearing off the sinus plate, it appeared healthy throughout, and so far as I could determine macroscopically, there was no break in its continuity. I removed the plate with a broad gouge and was surprised to come on a large perisinous abscess. The sinus wall was thickened and covered with diseased granulations almost one-half inch thick. In the direction of the bulb the sinus wall was necrotic and seemed to be detached and drawn away from the sinus groove. I removed the plate well above the knee and downward as far as possible to the bulb, and the cavity was then packed temporarily.

I then proceeded to the neck operation. The internal jugular was readily found and showed no evidences of disease. I ligated below the facial and closed the wound.

Returning to the sinus, I packed off the latter in the usual manner and made a liberal incision into the sinus wall but no free pus was demonstrated. Relieving the pressure from the bulbar plug, no bleeding occurred. With a ring curet I succeeded in dislodging several large, well organized clots, after which there was some free bleeding. Relieving the pressure from the torcular end, no bleeding occurred for a moment or two, after which a large clot came away, followed by appreciable bleeding. As well as I could determine, the internal wall of the sinus appeared normal.

The entire cavity was then packed with iodoform gauze and the wound sutured. The child stood the operation surprisingly well, and was sent down from the operating room in good condition.

On the morning of July 31, the patient seemed much brighter, having rallied from the operation. In the evening the temperature again rose to 104 F., but there was not the preceding chill, and the temperature seemed to rise more gradually than on previous occasions.

On the morning of August 1 the child's general condition was good; the temperature was 100 F., pulse 110 and respiration 24. The outer dressing was changed. The temperature rose again in the evening, but only reached 103 F., and was not preceded by a chill.

The temperature on the morning of August 2 was 101 F., pulse 104 and respiration 24; the child's condition was fair. The blood was typed and a transfusion of 300 cc. was given by the citrate method. A group 1 professional donor was used. No reaction followed the transfusion.

On August 3, owing to the persistence of a septic temperature, I performed the first full dressing. Nitrous oxide anesthesia was employed. The neck wound was clean, having healed by primary union. On removing the gauze packing from the sinus no bleeding followed; the wound in general appeared satisfactory, and no evidence of infection was noted. The highest temperature for the preceding twenty-four hours was 102 F.

On August 4, the general condition of the patient was good. In the morning the temperature was 100 F. The patient seemed unusually quiet during the day. She voided several times in bed and refused the bedpan. On examination, I

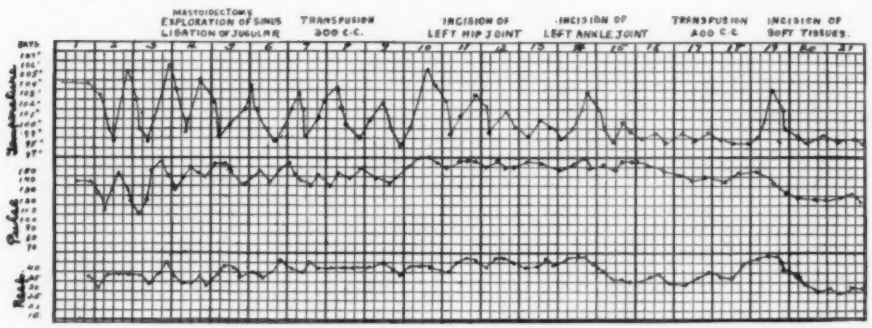
noted the child had pain on movement of the left lower extremity; there was tenderness on pressure and some swelling over the hip joint. Surgical consultation was suggested, the opinion being to wait another twenty-four hours. In the evening, the temperature rose to 105 F.

On August 5, the mastoid wound was dressed and nothing unusual noted. White blood cells were 23,000; polymorphonuclears, 89 per cent. The left hip showed a large fluctuating mass, and exploratory puncture revealed free pus. The same afternoon an incision was made over the cavity, an abundance of foul pus was evacuated and a tube and drain were inserted.

On three successive days, August 6, 7 and 8, the temperature did not have any acute elevations, but ranged between 100 and 103 F. The general condition of the patient was improving rapidly.

On August 9, the mastoid wound was dressed and appeared to be doing well. Pain and swelling were noted over the left ankle joint, but the opinion of the surgeon was to wait another twenty-four hours before incising. The temperature in the evening rose to 103 F.

On August 10, the ankle joint was incised and a greenish pus was released. The left hip was healing slowly, and a considerable amount of pus was draining from the wound.



Temperature, pulse and respiration chart.

On August 11, transfusion was again performed, the patient this time receiving 250 cc. by the citrate method. The donor who gave the previous transfusion was used.

On August 12 and 13, the patient improved rapidly. The neck wound had entirely healed and the mastoid cavity was fast being obliterated. The hip joint had also ceased discharging and was practically well. The ankle joint was still draining.

On the morning of August 14, pain and redness over the lower aspect of the right joint behind the neck of the femur were noted, pointing to a deep seated abscess in the soft tissues of the thigh. A roentgenogram of the hip joint was negative and the collection of pus was extracapsular. The temperature reached 104 F. in the evening.

On August 15, the manifestations over the right thigh were more pronounced. The area was incised under gas oxygen anesthesia and an abundance of pus was evacuated. Following incision and release of pus from this site, the temperature dropped to normal, and remained so for the remainder of the patient's stay in the hospital. The abscess cavity over the right hip drained profusely for some days and was completely healed in two weeks. The patient was discharged from the hospital on September 14, well on the road to recovery. She continued treatment at my office until September 24, at which date I discharged her. She had a dry middle ear without any perforation and her hearing was practically normal. The posterior wound and the neck incision were quite healed. The function of the involved joints was completely restored.

COMMENT

This case presents several interesting clinical features, to which I wish to invite particular attention.

1. This patient never showed a positive blood culture, despite the fact that there was such extensive disease demonstrable at operation. Furthermore, one should expect a positive blood culture when a condition runs a pyemic course. Cases of sinus thrombosis do occur without obtaining a positive culture. Due care was exercised in taking the specimens of blood when the circulation was more apt to contain most bacteria, which, it is agreed, is at the time immediately following the chill or when the temperature is at its maximum. Yet even with these precautions, the blood cultures remained persistently negative.

2. After ligation of the internal jugular vein and establishing drainage from the lateral sinus, it was evident that the infectious focus was not entirely excluded from the circulation. No free flow of blood was obtained from the bulbar end, and one, therefore, is compelled to believe that the communication with the general circulation continued to be somewhat maintained by the inferior petrosal sinus which enters the lateral sinus just below the bulb. It is probably through this source that the emboli gained entrance to the general circulation.

3. At the time of operation the sinus plate seemed unbroken, and yet the infectious process entered the lateral sinus at some point between the knee and the bulb. This, it is reasonable to suppose, in view of the fact that the preceding original extrasinus infection (which in this instance was the large perisinous abscess), was here located. The process must have made its way into the sinus either through a microscopic break in the plate or through the diploëtic veins.

4. This case bears out a well known clinical observation that cases of lateral sinus infection in which metastases to the joints and superficial tissues occur are more apt to survive. This patient had involvement of the left hip joint, the left ankle joint and the soft tissues about the right femur.

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FIBRO-ADENOLIPOMA OF THE TONSIL

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MERRILL, WIS.

REPORT OF CASE

History.—L. W., a girl, aged 8 years, was an adopted child, about whose family or previous personal history nothing was known. The present condition was discovered by the county nurse of Lincoln County in her routine examination of school children, and the child was sent to the family physician, who referred the case to me. The child was unaware of any abnormality in her throat, there being no subjective symptoms.

Fig. 1.—Section near base of tumor, showing epithelial covering, fibrous substructure and fatty interior. × 100.

On inspection of the fauces, a clubshaped tumor was seen arising from the cleft between the left tonsil and its posterior pillar, near the upper pole. It extended downward, forward and inward, its free end resting on the dorsum of the tongue. It was alabaster white excepting about 10 mm. near its origin, which was the color of the normal oral mucosa. The line between the two colors was sharply defined.

The tumor was snared and the tonsils were enucleated. On careful inspection, it was determined that the growth had arisen from the pos-

terior surface of the left tonsil, and not from the pillar. Its dimensions were 46 mm. in length, 12 mm. in diameter at the widest portion, which was about 10 mm. from the tip, and 4 mm. in diameter at its origin.

The Seelman Laboratories, Milwaukee, reported as follows: "The tumor is covered with a layer of stratified, squamous epithelium, beneath which is a rather thick layer of dense connective tissue. The center is made up of fat tissue, in which appear some bundles of muscle cells and clusters of glands. These are especially numerous in the portion nearest the base of the tumor. It is difficult to classify this tumor definitely. It is of a fibrolipoid type and is nonmalignant in character."

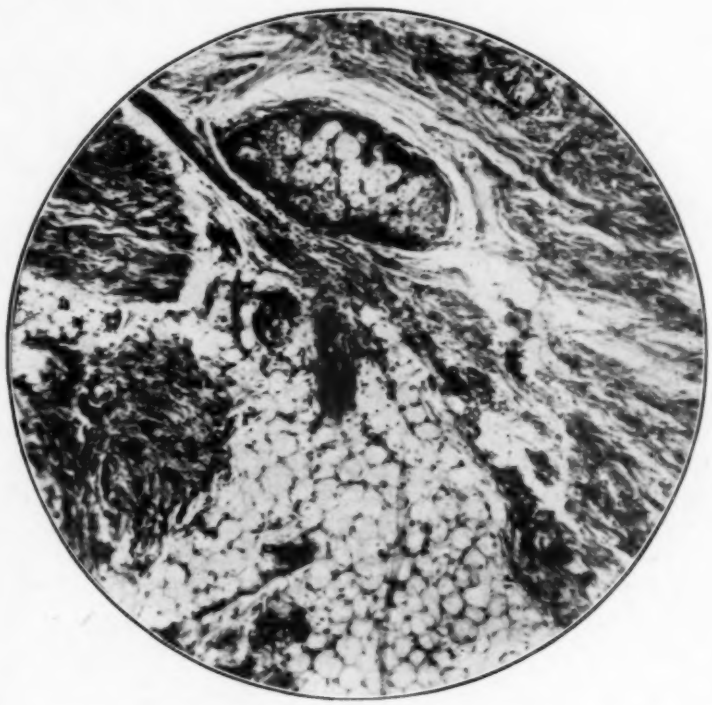

Fig. 2.—Higher magnification, showing fat cells and groups of glands. × 500.

REVIEW OF THE LITERATURE

Benign neoplasms of the tonsil are surprisingly rare, and fibrolipomas are especially so. Bosworth,[1] in 1892, was able to find only nine cases of benign tonsillar tumors reported: one fibrochondroma, one fibrolipoma, six pure fibromas, and one fibrolymphadenoma. Subsequent cases of benign tumors of the tonsil have been reported by Haug,[2] Hamilton,[3]

1. Bosworth: Diseases of the Nose and Throat **2,** 1892.
2. Haug: Lipo-myxofibrom der Mandel, Arch. f. Laryngol. u. Rhinol. **4,** 1896.
3. Hamilton, H. D.: Nonmalignant Tumours of the Tonsil, Montreal M. J. **25,** 1896-1897.

DeBlois,[4] Clark,[5] Roberts,[6] Theisen,[7] Zolki,[8] Pynchon,[9] Sommer,[10] Suhrawardy,[11] Beco,[12] Quarella,[13] Campbell,[14] Bruzzone,[15] Proetz,[16] and Sturm.[17] Among these there were three fibrolipomas; three lipomas; two fibromas; two papillomas; one each of lipomyxofibroma, lymphangioma, hemangioma and cyst; one "mixed tumor" and one not classified.

Quarella [13] reported his case as the eighty-ninth on record of a tumor of the tonsil, and the first on record of a mixed tumor of embryonal origin. He included malignant tumors in his enumeration, however.

According to Theisen,[7] in 1903, there were only six cases of lipoma of the tonsil on record, to which he added the seventh. I have been able to find only three subsequent cases of tonsillar tumor containing lipoid elements, namely, those of Zolki,[8] Sommer,[10] and Suhrawardy.[11] The case here reported is therefore the eleventh on record of a benign tonsillar tumor of the lipoid type.

NOMENCLATURE

Much confusion exists in the nomenclature of benign tonsillar tumors. Those consisting mainly of fibrous tissue predominate and the rarest are the pure lipomas. The other rare forms of tumor encountered in this locality are myxomas, teratomas, chondromas, and fibroadenomas.

Of sixteen cases which came to operation and in which the age of the patient was stated, one occurred in the first decade, two in the second, three in the third, two in the fourth, two in the fifth, three in the sixth,

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4. DeBlois, T. A.: Case of Fibro-Lipoma of the Tonsil, New York M. J. **70,** 1899.
5. Clark, J. P.: Papillomatous Growth of the Tonsil, Laryngoscope **8,** 1900.
6. Roberts, J. M.: Case of Papilloma of Tonsil, Arch. Otol. **25,** 55.
7. Theisen, C. F.: Case of Lipoma of Tonsil, Tr. Laryngol., Rhinol. & Otol. **9,** 1903.
8. Zolki, L.: Ueber ein congen. Fibrolipom d. Gaumentons, Ztschr. f. Ohrenh. **44,** 1903.
9. Pynchon, E.: Fibroma of the Tonsil, Illinois M. J. **9,** 1906.
10. Sommer, H.: Ein Lipom der Tonsille, Arch. f. Laryngol. u. Rhinol. **19,** 1907.
11. Suhrawardy, H.: Lipofibrome of the Tonsil, Indian M. Gaz. **46,** 1911.
12. Beco, L.: Fibrome de l'amygdale, Presse Oto-laryngol. **12,** 1914.
13. Quarella, B.: Mixed Tumor of Tonsil Region, Policlinico (Feb. 3), abstr. J. A. M. A. **68:**1441 (May 12) 1917.
14. Campbell, C. A.: Hemangioma of Tonsils, J. Mich. M. Soc. **17:**392 (Oct.) 1918.
15. Bruzzone, C.: Quattro casi di Tumori benigni delle Tonsille palatine, Bul. d. mal. d. Orechio. d. gol. e d. Nas. **39,** 1921.
16. Proetz, A. W.: Report of a Case of Tonsillar Cyst, Ann. Otol. Rhinol. & Laryngol. **32:**223 (March) 1923.
17. Sturm, F. P.: A Pedunculated Tumor of the Tonsil, Brit. M. J. **1:**377 (March) 1924.

and one in the tenth. They are probably always congenital, and the great discrepancy in the ages at which they are found can be ascribed to the absence of subjective symptoms, so that they are often present for years before being discovered.

Theisen [7] says, "They undoubtedly owe their origin to some congenital aberration, that is, misplaced fat cells. As the tonsil contains no fat, some misplaced fat cells must be present in embryonic life; and later, perhaps, owing to the lowered powers of resistance of the neighboring cells, the fat cells show a tendency to predominate and form a growth."

But Virchow held that the tonsillar submucosa normally contains some fat, and Frick claimed to have found fat in the tonsil repeatedly.[10] Lipomas of the tonsil, as well as those arising from the supratonsillar recess, are therefore homoplastic in origin.

COMMENT

Because of ease of access and removal, and the almost complete freedom from subjective symptoms, benign tonsillar tumors are of little clinical importance. Of twenty cases reported, there were no subjective symptoms whatever in seven, and they were insignificant in the others, consisting of dysphagia, slight pressure or cough. These tumors are usually discovered incidentally in examining the throat for other reasons.

Clinical Notes

ACCIDENTAL RUPTURE OF THE ETHMOID ROOF WITH SUBSEQUENT RECOVERY

JOHN G. HUNT, M.B.
LONDON, ONT.

The exposure of the dura during a mastoid operation is an every-day occurrence; in fact, some surgeons recommend it as a routine performance, claiming, among other things, to get quicker healing of the wound. Not so, however, in the case of the anterior cranial fossa, in which it is well recognized that the smallest crack in the inner plate of the frontal sinus or in the roof of the ethmoid is tantamount to a sentence of death by meningitis.

Appearance of scar at the time of writing.

The following case is unique in my experience, and the technic instituted is, so far as known, original.

W. H., a man, aged 30, well developed, was referred to me in August, 1924, by Dr. Nelson George, with a history of nasal catarrh and also a peculiar psychic disturbance which caused him to become extremely irritable and quarrelsome, so much so that he had been turned off his father's farm over a year before. Between times he was a cheerful and willing worker. A roentgenogram, made by Dr. Harold Wismer, showed a cloudy postethmoid and sphenoid on the left side.

Under local anesthetic, with the patient in a sitting position, the middle turbinate was removed and the ethmoid labyrinth, which was found to be soft and necrotic, was opened by means of gentle curretting.

The patient, who up to this time had exhibited unusual sang froid, suddenly developed faintness and complained of severe frontal pain. On looking high up into the nasal cavity, a continuous trickle of clear cerebrospinal fluid was observed, and also exposure of the pulsating dura about a quarter of an inch in diameter. The patient seemed to be doomed to a rapidly spreading meningitis, unless some means could be devised to prevent the spread of infection from the nasal cavity.

Desperate cases demand heroic measures. During the recent war, it had fallen to my lot to have charge of several hundred cases of gunshot wounds of the head, and I therefore decided to make use of a modification of the technic which had proved invaluable in limiting the spread of infection in these cases.

Method.—A large inverted U flap, using the eyebrow as its base, was turned down, exposing the whole left frontal area. The frontal sinus was then rapidly opened and the inner wall and adjacent bone removed over an area of about 1 inch in diameter. A blunt instrument was inserted and the dura was elevated over the roof of the ethmoid until, with the aid of a bent probe, the dehiscence was detected. The perforation in the bone was then carefully walled off by means of a strip of iodoform gauze, the ends of which were brought out at the inner angle of the wound. The skin flap was then temporarily closed by a few silkworm sutures.

After-Effects.—The patient was put to bed for a week, and the outer dressings were changed frequently. For the first two days the temperature was elevated as high as 102 F., and the patient complained of considerable head pain, but this gradually subsided. On the seventh day, under general anesthesia, the flap was reopened and the gauze strip gently removed; the frontal sinus was swabbed with bichloride solution; the infundibulum was filled with bone wax as an additional precaution, the wound was closed, leaving only a small wick drainage at the lower angle.

From this time on the patient's recovery was uneventful, except that several months later the bone wax, which I now realize to have been superfluous, was gradually extruded through the lower angle of the frontal wound. The present condition of the patient is excellent, and his nervous irritability is a thing of the past.

A NEW INSTRUMENT FOR THE TREATMENT OF CHRONIC CATARRHAL OTITIS MEDIA WITH SUPERHEATED AIR*

JOHN GUTTMAN, M.D.
NEW YORK

The most frequent etiologic factor in chronic otitis media is an occlusion of the eustachian tube, caused by an extension of the inflammatory process of the mucosa of the nose and throat to the mucosa of the eustachian tube. The occlusion, according to Bezold, produces an absorption of oxygen from the blood in the tympanic cavity and an increased production of carbon dioxide. Heat increases the flow of blood, thereby increasing the production of oxygen and eliminating acids, chiefly carbon dioxide.

In most infectious processes, nature produces what we call "inflammation": an increased amount of heat followed by an increased flow of blood to the infected area, which eliminates the increased acidity and renders the exudate alkaline. In all inflammatory affections, heat has a potent remedial effect for the reason before stated. In obstinate joint conditions, heat, in the form of so-called baking, is an efficient and frequently used remedial procedure.

In catarrhal otitis media, the increased exudate becomes organized in course of time, forming connective tissue and pseudomembranous bands. The joints of the ossicles become ankylosed, so that, by the same mode of reasoning, heat should have the same beneficial remedial effect in chronic catarrhal otitis media as so-called baking has in chronic inflammations of the large joints of the body.

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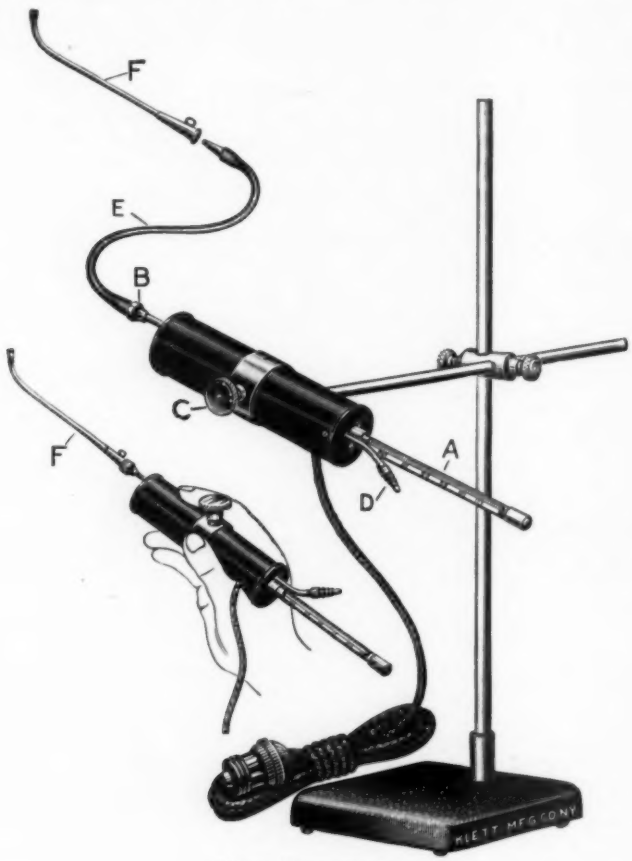
* Read before the Otological Section of the New York Academy of Medicine, Jan. 8, 1926.

TREATMENT

In inflammatory affections of the ear with its rich blood supply, heat was used since ancient times as an efficient remedy. In acute otitis media the instillation of hot oil into the ear canal is an old house remedy. Oil, being a bad conductor of heat, will retain its heat for a comparatively long time. Hot poultices in acute ear conditions are frequently used for their beneficial effect. It is reasonable to expect, therefore, that in subacute or chronic cases of catarrhal otitis media, heat will also act beneficially.



New instrument.

At present, the most frequent treatment of chronic catarrhal otitis media is confined almost entirely to catheterization and politzerization. In selected cases, medicated air or liquid is insufflated into the tympanic cavity. The insufflation of heated air was recommended also by J. A. Andrews,[1] by G. W. Hopkins,[2] and by others. Owing to the difficulty in the manipulation of the different procedures or for other unknown reasons, these methods of treatment, with the exception of catheterization and politzerization, have not found much favor with otologists.

1. Andrews, J. A.: Arch. Otol., No. 1, 1899.
2. Hopkins, G. W.: Ann. Otol., Rhinol. & Laryngol. (Feb.) 1902.

DESCRIPTION OF INSTRUMENT

The instrument which I recommend is designed to heat air coming from a Politzer bag, or preferably from a compressed air pump. This air can be heated to about 250 F., provided the pressure is kept constant.

The instrument consists of the following parts:

1. A closely wound copper tube.
2. An electric heating unit enclosing the copper tube.
3. A heat regulating device.
4. An enclosing insulated shell, with intake and outlet for the air current.

These parts are built into a nickel-plated metal shell, 2 inches in diameter and 5 inches long. Both ends of the coiled inner tube lead to the outside of this shell.

The air intake tube (D) is provided with a hose nipple, over which a rubber tube can be slipped to connect the apparatus with the air supply. The outlet tube has on its extreme end a hose nipple (B), to which a three-sixteenth inch rubber hose (E) can be attached. This in turn connects with an ear catheter (F).

It is necessary to make the hose line from the apparatus to the catheter as short as possible so as to avoid the loss of heat through radiation.

In order to avoid the contact of the heated metal catheter with the tip of the nose, which is very sensitive to heat, a thin rubber tubing can be slipped over the distal end of the catheter.

The heat regulating part consists of a thermostat. This controls the heat by turning a large knurled head screw (C). Turning the screw to the right will increase the heat and turning it to the left will decrease it. A thermometer (A) is attached to the instrument to indicate the degree of heat applied.

The apparatus may be operated from any 110 to 125 volt lamp socket. Either alternating or direct current can be used.

The instrument can be held in the hand or can be clamped to a stand, thus leaving one hand free for action.[3]

COMMENT

Following the treatment with this instrument, an increased redness can be seen, especially in the upper quadrant of the tympanic membrane, in a majority of the patients. Fine, thin blood vessels will be seen running down toward the short process of the hammer and along the upper, anterior and posterior border of the tympanic ring. The effect of this treatment in suitable cases is quite striking. In a comparatively short time the noises in the ear become less distressing, and in some cases disappear entirely. The beneficial effect on the hearing is in some cases also quite marked. Up to the present, the effect of this treatment on the hearing was not examined in a sufficient number of cases with my audiometer (acumeter) and therefore definite, reliable statistics of its effect on hearing cannot be presented.

The advantages of this instrument over similar instruments previously recommended are: (1) that the temperature can be regulated by increasing or decreasing the air pressure; (2) that the temperature can be kept constant and does not increase with the length of time in use; (3) that it is easy to manipulate.

987 Madison Avenue.

3. The instrument is made by the Klett Manufacturing Company, 202 East Forty-Sixth Street, New York City.

TRACHEO-ESOPHAGEAL FISTULA DUE TO CARCINOMA OF THE ESOPHAGUS

Valuable Diagnostic Aid

M. C. MYERSON, M.D.
NEW YORK

In the case of carcinoma of the esophagus here reported, the observation of Vinson was the only finding which demonstrated the presence of a tracheo-esophageal fistula. Vinson[1] has noted that in cases of carcinoma of the esophagus which have perforated into the trachea or bronchus, a swallowed thread would find its way through the fistula and keep twisting itself around the tracheo-esophageal wall by successively passing through the esophagus after emerging from the larynx (fig. 1).

REPORT OF CASE

A man, aged 68, was referred to me by his family physician in October, 1925. His chief complaint was difficulty in swallowing, which he first noticed six months previously. Until one week before examination, he was able to eat semisolid food; since then he had sustained himself with liquids. He had lost from 10 to 15 pounds (from 4.5 to 6.8 Kg.) in weight during the last six months. In the twenty-four hours before examination, he could take no liquids whatever.

On physical examination, the patient showed evidence of being moderately underweight, and slightly cachectic. He localized the obstruction in the region of the fourth rib anteriorly. He was referred for fluoroscopic and roentgenographic study to Dr. R. A. Rendich, who reported:

"Fluoroscopic and roentgenographic examination of the esophagus reveals the following:

"Considerable difficulty is witnessed during the attempt to swallow a semisolid mixture. Only a minute quantity passes at a time, the mixture soon finding its way into the trachea through the glottis, thereby obscuring the contour of the esophagus.

"There appears to be an irregularity of contour of the esophageal wall at the level of the third and fourth dorsal vertebrae.

"A large part of the mixture finds its way into the trachea and bronchi of both sides; no direct connection between the trachea and esophagus is noted.

"Examination with a liquid mixture offers even more difficulty; practically all this mixture enters through the glottis into the trachea.

"*Conclusion.*—The indirect findings indicate a new growth of the esophagus, at the level of the third and fourth dorsal vertebrae."

It is to be noted from Dr. Rendich's report that the barium mixture was observed fluoroscopically to enter the tracheobronchial tree through the larynx. There was no evidence, either fluoroscopically or roentgenographically, that the patient had a tracheo-esophageal fistula. The possibility of such a condition was naturally considered, because the tracheobronchial tree was so well portrayed as a result of the barium mixture which found its way into it. It was thought, however, that the barium mixture overfilled the obstructed upper esophagus, and that the excess had found its way into the larynx. It was decided to perform dilatation with the Plummer bougies, and to insert a sterling silver intubation tube through the strictured area. The patient was accordingly

1. Vinson, Porter P.: Carcinoma of the Esophagus, Am. J. M. Sc. **166:** 402 (Sept.) 1923.

given five yards of thread to swallow, which was to serve as a guide for the bougies. At esophagoscopy there was noted some eighteen to twenty strands of thread coming out of the larynx and entering the esophagus. These strands were seen to disappear into the carcinomatous area. The thread then was cut through with special laryngeal scissors and removed. The patient was immediately referred for gastrostomy. The observation of Vinson in this type of condition, and the illustration in his article, made the situation clear to me at once.

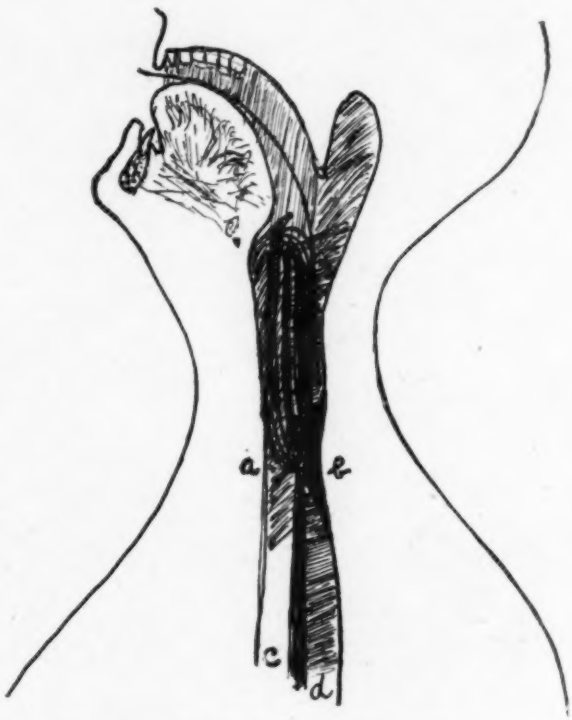


Fig. 1.—Semidiagrammatic drawing, showing thread passing through esophageal opening into trachea out of larynx and into the esophagus again. *a*, fistula; *b*, carcinomatous area; *c*, trachea; *d*, esophagus.

COMMENT

This is an interesting case of tracheo-esophageal fistula, in which the only evidence of the fistula was the winding of the swallowed string about the tracheo-esophageal wall. At no time before I saw him did the patient's clinical behavior indicate that food was getting into the tracheobronchial tree.

Vinson[2] states that he has had cases of fistula in which the string did not wind itself around the tracheo-esophageal wall; therefore this observation does not warrant the use of the string finding as an infallible diagnostic aid for the condition of tracheo-esophageal fistula. However, the fact is that in this particular case the only positive evidence we had of the existence of a tracheo-esophageal fistula was the behavior of the swallowed string. This observation may therefore frequently be of value. Vinson has called attention to the fact

2. Vinson, Porter P.: Personal communication.

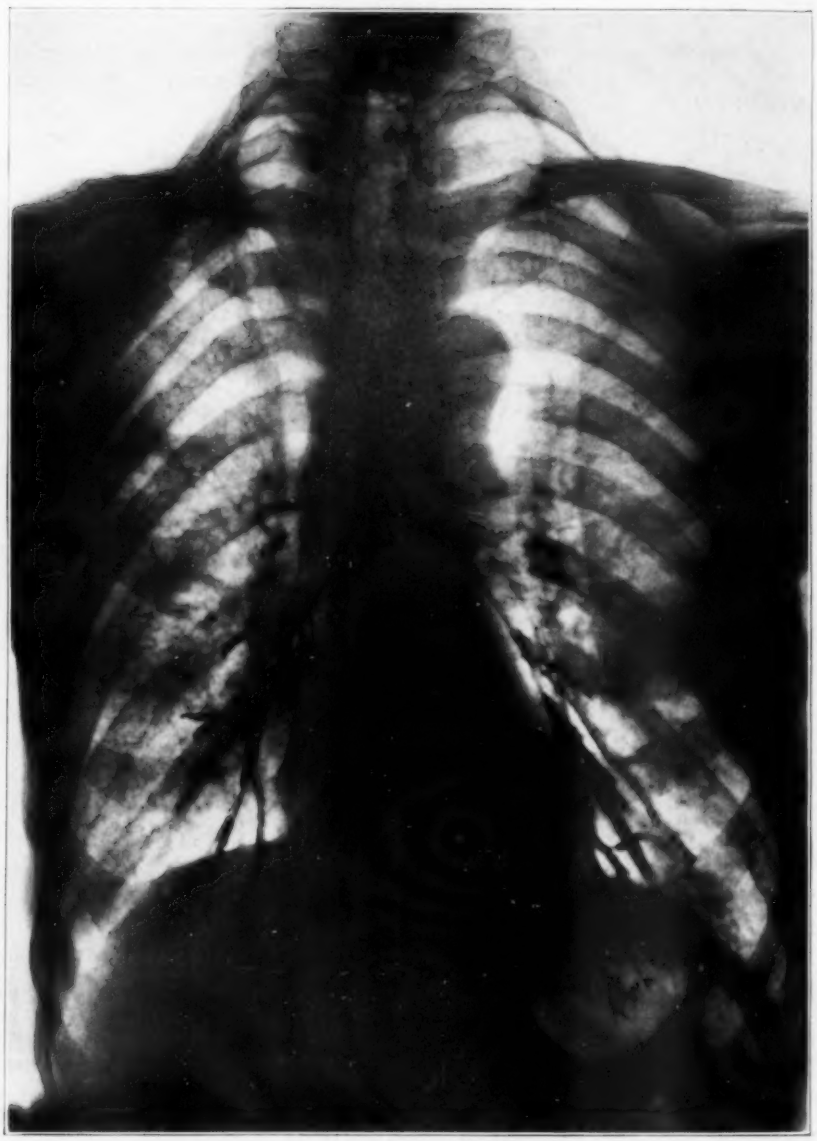


Fig. 2.—Anteroposterior view of chest, showing tracheobronchial tree outlined.

Fig. 3.—Oblique view, demonstrating tracheobronchial tree and crossing of esophagus by left main bronchus.

that when the thread has passed into the stomach, a considerable length of it can be pulled out, while in cases of fistula in which the string is wound about the party wall, very little, if any, of the string can be pulled out. It is of interest to note that the barium mixture which entered the tracheobronchial tree of this patient caused no untoward symptoms, for at the time of submitting this report, four months had elapsed, and the patient had had no pulmonary symptoms.

30 East Fortieth Street.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

TUMORS OF THE NOSE AND THROAT*

GORDON B. NEW, M.D.
ROCHESTER, MINN.

NOSE AND NASOPHARYNX

Levin [1] reports a case of cyst of the vomeronasal organ in a man, aged 25, which condition had been present since he was a small boy. It had disappeared at times until he was 17; for the following eight years it had been permanent. There was a fluctuating swelling about the size of a "tangerine orange," which filled the anterior nares, bulging the nose and the cheeks. The frontal process and the maxilla were deviated laterally. Under tracheal anesthesia, an attempt was made to remove the cyst through an incision underneath the upper lip. The cyst ruptured, however, and the greater part of the cyst wall was removed and the pocket was packed with gauze.

Levin reviews very carefully the differential diagnosis and the microscopic pathology. He believes, from the histologic appearance of the cyst, that it is of vomeronasal origin.

Santi [2] reports a case of melanotic sarcoma of the septum in a woman, aged 27. The patient had felt a tumor inside of her nostril five months previously. The tumor, which was attached to the cartilagenous septum, was about 3.5 cm. in diameter, and was removed under general anesthesia. Following this, radium treatment was given. About a year later the tumor blocked the right nostril completely. Microscopic examination showed the growth to be melanotic sarcoma, with no glandular involvement. Lateral rhinotomy was performed twice, each time followed by radium treatment. There was no recurrence ten months after the last radium treatment.

The history and the fact that there was no glandular involvement, indicates that the tumor must have been of a low-grade type of malignancy, although a melanosarcoma.

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* From the Section on Laryngology, Oral and Plastic, Mayo Clinic.

1. Levin, J. J.: Cyst of the Vomeronasal Organ, Edinburgh M. J. **32**:296-301 (June) 1925.

2. Santi, P. R. W.: Melanotic Sarcoma of the Septum Nasi, Brit. M. J. **1**: 109-110 (Jan. 17) 1925.

McArthur [3] reports a case of malignant granuloma of the nose in a patient, aged 42. The tumor was situated on the septum just posterior to a perforation which had followed a submucous resection. In spite of treatment the condition progressed, perforating the palate and involving the pharynx. Microscopic examination of the tissue showed a vascular subepithelial growth, extremely cellular, similar to that in cases reported by Woods.

Parrish and Taylor [4] report a case of fibroma of the nasopharynx which recurred after operative removal. The patient was treated with radium with good results.

PHARYNX

Hayden and Hagens [5] report a case of hemangioma of the pharynx in a man, aged 24. The tumor involved the pharynx from the region of the tonsils to the epiglottis and down into the pyriform sinuses, including the arytenoids and the ventricular bands.

Huey [6] reports a case of extensive lymphangioma of the pharynx and larynx in a man, aged 22. At the age of 6, the patient had had difficulty in swallowing and trouble in breathing. Examination showed a tumor of the posterior wall of the pharynx, extending from the margin of the soft palate down to the larynx. The tumor was about 6 cm. in diameter, with a smaller tumor to the left. The smaller tumor was removed, and the larger tumor was dissected out following tracheotomy. Roentgenograms are shown demonstrating the situation and size of the tumor.

New [7] has published a detailed statistical report of the tumors in this region that were examined and treated in the Mayo Clinic from 1917 to 1923. Tabulations are shown, giving the result of treatment in each of the groups. In the summary New states that malignant tumors of the pharynx and nasopharynx are usually of a very high grade of malignancy, either lymphosarcomas or epitheliomas, grade 3 or 4 (Broders). In the treatment and prognosis of pharyngeal tumors, Broders' gradation of epithelioma is of definite clinical value. For treatment, discrimination is necessary in the selection of patients with extensive malignant lesions of the pharynx and nasopharynx, as in certain instances the treatment is detrimental rather than beneficial. If treatment is given, it should

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3. McArthur, G. A. D., and Dew, H. R.: Malignant Granuloma of the Nose, J. Laryngol. & Otol. **40**:378-380 (June) 1925.

4. Parrish and Taylor: A Case of Fibroma of the Nasopharynx Treated with Radium Following Recurrence After Operative Removal with Good Results, Ann. Otol., Rhinol. & Laryngol. **34**:219, 1925.

5. Hayden, D. B., and Hagens, E. W.: Hemangioma of the Pharynx and Larynx, J. A. M. A. **84**:1495 (May 16) 1925.

6. Huey, A. J.: Lymphangioma of the Pharynx and Larynx, Laryngoscope **35**:113-115 (Feb.) 1925.

7. New, G. B.: Treatment of Malignant Tumors of the Pharynx and Nasopharynx, Surg., Gynec. & Obst. **40**:177-182 (Feb.) 1925.

be thorough and radical; it may consist of operation, cautery or diathermy, radium or roentgen ray, or of a combination of these methods, as indicated. Most of the patients treated receivel marked symptomatic relief. Life was prolonged for months or even years in some cases; in others, the patients are apparently cured.

Mixed tumors of the pharynx should be removed surgically, if possible, and other forms of treatment used only if the tumor is inoperable.

LARYNX

Lewis [8] again emphasizes that operation is the treatment of choice in all cases of operable carcinoma of the larynx. He believes that biopsy should be made before radical operation is performed. When it can be employed, he prefers rectal anesthesia in preference to local or ether anesthesia.

Moore [9] reviews the literature on chondromas of the larynx and reports a case.

Manasse,[10] in discussing tuberculoma of the upper respiratory tract, defines the term tuberculoma as a circumscribed tumor often mistaken for a malignant growth, smooth and never ulcerated, projecting above the surface of the mucous membrane. This is in distinction to the tuberculous infiltrations and ulcerations. The pachydermous nodules in the posterior part of the larynx that show traces of tuberculosis microscopically are excluded. Two types of tissue usually compose the true tuberculoma: granulation tissue and tuberculous tissue. The microscopic differentiation of syphilis and tuberculosis is very important in this group of tumors. The nose is the most common site for tuberculoma, which usually occurs on the septum, sometimes on both sides. The growth is generally like a mushroom, obstructing both nostrils. The upper part of the septum may be destroyed, with displacement of the soft part of the nose upward and outward. Patients with tuberculomas may or may not have general tuberculosis.

Manasse believes that excision of the tumor is much more preferable to the use of galvanocautery. He does not discuss diathermy. His prognosis in cases of laryngeal tuberculoma is not favorable.

Leegaard [11] reports a case of a large fibroma of the larynx in a man, aged 60. Tracheotomy was performed and the tumor was removed

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8. Lewis, F. O.: Laryngeal Cancer, Its Treatment, with Special Reference to Total Laryngectomy, Laryngoscope **35**:607-610 (Aug.) 1925.

9. Moore, I.: Cartilagenous Tumors of the Larynx (Study of All the Recorded Cases), J. Laryngol. & Otol. **40**:145-164 (March) 1925.

10. Manasse, Paul: Tuberculomas of the Upper Respiratory Tract, Yearly Courses for Physicians, No. 11, **2**:8-11, 1924.

11. Leegaard, Frithjof: Larynxfibroma of Unusual Dimensions, Acta Otolaryngol. **8**:221-223, 1925.

perorally by means of a snare. The tumor was 2 by 2 by 2.5 cm. Microscopically, it was shown to be a myxofibroma.

Hubbard and Galbraith [12] report the use of diathermy in the treatment of papilloma of the larynx in children and in adults. While they do not attempt to present conclusive evidence, they feel that diathermy is giving better results than any other method tried. The small and large Wappler machines were used.

Salinger [13] reports the use of radium emanation in the treatment of forty cases of carcinoma of the larynx, both intrinsic and extrinsic. Five of the patients are still living; one had had an intrinsic epithelioma treated three years previously, one patient had been treated three and one-half years, and one, two years and eight months before. The other two patients had been well only six and ten months, respectively.

The results show what is generally conceded by most radiologists, that the surgical treatment of carcinoma of the larynx is usually the only treatment which offers permanent cure.

ESOPHAGUS

Guisez,[14] in an extensive article, reviewed his work for twenty-two years, on lesions of the esophagus. During this time, he had observed 2,800 cases of esophageal disease, 1,430 of these being carcinoma. He asserted that 5 per cent of all carcinomas are located in the esophagus. In a series of 406 cases of esophageal carcinoma, 202 patients were more than 55 years of age; the youngest patient was 14. Four of his cases followed benign cicatricial strictures. Dysphagia was the most common early symptom, being present in 98 per cent of the patients. Two hundred seventy patients had been treated by radium. Thirty of the patients lived more than eighteen months; two of them had not had recurrences after ten and eleven years, one had had no recurrence in five years, four none in four years, and twelve were free from disease after one and a half years. He prefers intubation of the malignant stricture in preference to gastrostomy.

Hill [15] reviewed his experience in the treatment of seventy-seven cases of esophageal carcinoma by radium. In one-third of the cases there was remarkable improvement. In one-third the improvement was substantial,

12. Hubbard, Thomas, and Galbraith, E. G.: The Treatment of Papilloma of the Larynx by Fulguration and Diathermy, Arch. Otolaryngol. **1**:70 (Jan.) 1925.

13. Salinger, Samuel: Radium Emanation in Carcinoma of the Larynx, Arch. Otolaryngol. **1**:286-295 (March) 1925.

14. Guisez, J.: Malignant Tumors of the Esophagus, J. Laryngol. & Otol. **40**: 213-232 (April) 1925.

15. Hill, W.: Radium Therapy in Cancer of the Esophagus; Results of Fifteen Years' Experience, J. Laryngol. & Otol. **40**:73-83 (Feb.) 1925.

and in one-third there was no benefit. Three patients died following instrumentation associated with the introduction of radium.

Mills and Kimbrough [16] report sixty-seven cases of carcinoma of the esophagus treated with radium, the longest duration of life after treatment being two and one-fourth years. Practically all of their patients lived less than one year.

Jackson [17] summarizes his experience with carcinoma and sarcoma of the esophagus, and makes a plea for early diagnosis. He describes dilatation of malignant strictures of the esophagus and advocates early gastrostomy.

Symonds [18] reports his experience with palliative intubation of malignant esophageal strictures. He believes that if advice is sought in the early stages, gastrostomy will not be required.

Souttar [19] emphasizes the fact that carcinoma of the esophagus is highly malignant. He recommends a flexible wire tube for intubating. He believes that surgery is inadvisable and does not recommend gastrostomy as a palliative measure.

Osmond [20] recommends dilatation of malignant esophageal strictures.

Eggers [21] reports resection of the thoracic portion of the esophagus for carcinoma by the Torek operation, with no evidence of recurrence after one year.

Vinson and Moersch [22] report their experience with dilatation for carcinoma of the esophagus, and describe their method of treatment. In 502 dilatations, there were three deaths, due to splitting of the esophagus during dilatation. In the same period three spontaneous perforations occurred in a group of seventy-five cases in which dilatation was not performed.

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16. Mills, R. W., and Kimbrough, J. H.: Cancer of the Esophagus Treated with Radium, Am. J. Roentgenol. **13**:247-249 (March) 1925.
17. Jackson, C.: Carcinoma and Sarcoma of the Esophagus: A Plea for Early Diagnosis, Am. J. M. Sc. **169**:625-648 (May) 1925.
18. Symonds, C.: Short Tube for Treatment of Stricture of Esophagus, Guy's Hosp. Rep. **75**:141-146 (April) 1925.
19. Souttar, H. S.: Carcinoma of the Esophagus, Proc. Roy. Soc. Med. (Sect. Surg.) **18**:41-45 (April) 1925.
20. Osmond, J. D.: Obstruction of the Esophagus, Radiology **4**:312-321, 1925.
21. Eggers, C.: Resection of the Thoracic Portion of the Esophagus for Carcinoma, Surg. Clin. N. Am. **5**:521-524 (April) 1925.
22. Vinson, P. P., and Moersch, H. J.: Dilatation Versus Gastrostomy as a Palliative Treatment of Carcinoma of the Esophagus, J. A. M. A. **84**:658-659 (Feb. 28) 1925.

News and Comment

AMERICAN BOARD OF OTOLARYNGOLOGY

An examination will be held by the American Board of Otolaryngology in Montreal (Otolaryngological Clinic, Royal Victoria Hospital), on Tuesday, June 1, 1926. Applications should be made to the Secretary, Dr. H. W. Loeb, 1402 South Grand Boulevard, St. Louis, Missouri.

ANNUAL MEETINGS

The American Laryngological, Rhinological and Otological Society will hold its annual meeting at the Mount Royal Hotel, Montreal, Canada, May 31 to June 2, inclusive. President, Dr. John M. Ingersoll, Cleveland, Ohio; Secretary, Dr. Robert L. Loughran, 145 West 58th St., New York City.

The American Otological Society will hold its annual meeting at the Mount Royal Hotel, Montreal, June 2 and 3, 1926. President, Dr. Thomas J. Harris, New York City; Secretary, Dr. D. Harold Walker, 390 Commonwealth Avenue, Boston.

The American Laryngological Association will hold its annual meeting at the Mount Royal Hotel, Montreal, Canada, June 3 to 5, 1926, inclusive. President, Dr. Greenfield Sluder, St. Louis; Secretary, Dr. George M. Coates, 1811 Spruce Street, Philadelphia.

LOCAL SOCIETY MEETINGS

BALTIMORE: The Section on Otology and Laryngology, of the Baltimore City Medical Society, meets on the last Friday of each month, at 1211 Cathedral Street, at 8:30 p. m. Chairman, Dr. Sylvan Rosenheim; Secretary, Dr. Edward A. Looper.

CHICAGO: Chicago Laryngological and Otological Society meets on the first Monday of the month from October to May at the Crystal Room, Great Northern Hotel. Chairman, Dr. E. H. Norcross; Secretary, Dr. A. A. Hayden, 25 East Washington Street.

CLEVELAND: Ophthalmological and Otolaryngological Section of Cleveland Academy of Medicine meets on the fourth Friday of each month at the Winton Hotel. Chairman, Dr. E. W. Garrett; Secretary, Dr. M. Paul Motto, Rose Building.

DENVER: The Colorado Oto-Laryngological Society meets on the first Saturday of the month from October to May, at the Assembly Room, Metropolitan Building. President, Dr. William C. Bane; Secretary, Dr. C. Howard Darrow, Metropolitan Building, Denver.

KANSAS CITY, MO.: Kansas City Eye, Ear and Nose Society meets on the evening of the third Thursday of each month from September to May, at the Baltimore Hotel. The afternoons of the third Thursday of November, January and March are given over to clinical work. President, Dr. James May; secretary, Dr. A. E. Eubank.

MILWAUKEE: Milwaukee Oto-Ophthalmic Society meets on the third Tuesday of the month, at the University Club, at 6:30 p. m. President, Dr. John E. Guy; Sec.-Treas., Dr. John J. Brooks, Majestic Building.

NEW YORK: Otological Section of New York Academy of Medicine meets on the second Friday of each month from November to May, at 17 West 43d Street. Dr. James Morisset Smith, Chairman; Dr. J. L. Maybaum, 12 East 86th Street, Secretary. Laryngological and Rhinological Section of New York Academy of Medicine meets on the fourth Friday of the month from November to May, at 17 West 43d Street. Otolaryngological Section of the Kings County Medical Society meets on the second Wednesday of January, March and May, at 1313 Bedford Avenue, Brooklyn. Chairman, Dr. Harry Meyersberg; Secretary, Dr. Charles Breitman, 210 Brooklyn Avenue, Brooklyn.

PHILADELPHIA: Section on Otology and Laryngology of the College of Physicians of Philadelphia meets on the third Wednesday of each month from October to June, at 8:30 p. m., at the College of Physicians. Chairman, Dr. Fielding O. Lewis; Secretary, Dr. James A. Babbitt, 2117 Chestnut Street.

Abstracts from Current Literature

Ear

SLOW NYSTAGMUS. G. V. T. BORRIES, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:318 (Jan. 18) 1926.

Borries reports the histories of nine patients, in whom the rotary turning and partly the caloric tests produced a very slow nystagmus reaction. Four of these patients had syphilis, the other five suffered from various diseases (nicotine toxic neurolabyrinthitis, rheumatic paresis of the facial nerve, sequelae of encephalitis, cyst in the motor region of the cerebrum, labyrinthitis). The slow reaction does not seem to allow certain conclusions concerning the etiology or the localization of the disease. It must be regarded as a weakening of the reaction. A slow nystagmus reaction after turning can be combined with a normal caloric reaction. In this case a slow nystagmus after turning, in the horizontal plane, may be the only vestibular abnormality. In other cases the nystagmus after turning may also be affected in the same manner in the frontal and sagittal plane. A slow nystagmus reaction, after turning, in the frontal and horizontal plane may be combined with a peculiar reaction in turning in the sagittal plane, namely, absence of the vertical nystagmus upward after turning, in the presence of a strong vertical nystagmus downward, after turning. In cases in which also the caloric nystagmus is slowed up, sometimes other signs of an affection of the caloric reaction can be shown, for instance, weakening of missing reversion of the caloric nystagmus when the head is bent forward. It is characteristic of the slow nystagmus that the reaction is transitory, so that slowing down and normal velocity may change at the same sitting. In other cases, the abnormality can be permanent for a longer time. Another peculiarity is the bilateral and symmetric occurrence. If the affection is limited, for instance, to the reaction in the horizontal plane, after turning, it is found, as a rule, that the reaction is the same on both sides. This bilateral symmetric occurrence of the slow nystagmus reaction in connection with the varying and transitory nature of this phenomenon points to the close connection with the central labyrinthian mechanism of compensation. The cases can be classified into two groups concerning their pathogenesis: first, a peripheral neurolabyrinthian affection may be present which causes a slow nystagmus reaction by virtue of an atypical course of compensation; second, an intercranial disease may cause a lesion or affection of the central paths of the vestibular nerve and the mechanism of compensation.

AMBERG, Detroit.

FROM THE PROCEEDINGS OF THE GERMAN OTOLARYNGOLOGICAL SOCIETY

RECURRING CERUMEN OBTURATOR. BERBERICH, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:448 (Nov.) 1925.

This author quotes extensively from former investigators, then enters fundamentally and in great detail into his own investigations. He states that the literature shows that the problem has not heretofore been solved; that the idea that obturating cerumen is due to local factors is largely erroneous.

Further, that it is associated with increased sebaceous production all over the body surface, is often familial, and is dependent on the cholesterin content of the blood.

The condition is produced largely by the sebaceous glands of the external canal of the ear, and only to a slight degree by the coil glands, which produce the pigment and the phospholipoids, while the sebaceous glands produce the cholesterin esters and their compounds. The products of the sebaceous and oil glands are mixed in the hair shaft in children and in the canal in adults.

So-Called Secretory Middle Ear Catarrh. Forschner, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:477 (Nov.) 1925.

Secretion was withdrawn under strict aseptic precautions by an aspirating syringe with a curved needle; culture was made on various mediums, guinea-pigs were injected, and corneal abrasions were inoculated. Nevertheless, many were bacteriologically negative, even though most were rich in neutrophile cells.

The author concludes that secretory catarrh is analogous to serous paranasal sinus disease in that it is inflammatory; it is not, however, due to any specific infection. On practical grounds it is a clinical entity, separable from suppuratve otitis media. The cytologic findings and the adhesive process sequelae indicate its inflammatory character.

All the middle ear cavities are filled with the secretion, and this appears to be somewhat dependent on the pneumatization status.

The most frequent cause of this condition is acute rhinitis. Bacteriologically, it is unexplained.

The sterile findings may be explained as follows: (*a*) the exudate is sterile; (*b*) the investigation methods are insufficient; (*d*) the organisms are microscopically invisible; (*e*) the bacteria are in the mucosa but not in the exudate. Possibly provocative measures may disclose them.

Etiology of Secretory Catarrh, Particularly with Nasopharyngeal Tumors. Ruttin, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:481 (Nov.) 1925.

There are two views of the genesis: transudate ex vacuo and hypovirulent infection. Ruttin observes that there is no specific clinical picture and no specific cause.

He differentiates as follows: 1. Tumors of the nasopharynx. 2. Rhinoscleroma, syphilitic and other cicatrices and processes leading to tubal stenosis. 3. Chronic nasopharyngeal disease. 4. Acute nasopharyngeal disease. 5. As a precursor of acute otitis. 6. As a sequel of myringitis bullosa.

In conditions resulting from tumors, the exudate may be present months or years without resulting in acute otitis media, and may exist in the presence of a permeable tube. Tumors lying below the tube, that is, malignant glands, as a rule do not cause secretory catarrh. Ruttin believes it is a transudate resulting from lymphatic and venous stasis, and exhibits specimens from a patient with a malignant condition, showing the dilated vessels.

In group 2 with stenosis of the tube, the findings are most often a thickened, retracted membrana tympani, with dry catarrh, seldom secretory catarrh. Also sometimes one finds secretory catarrh with easily inflatable tube.

Analogous to this explanation is that of plastic labyrinthitis, with hyaline exudate, due to tumor growth surrounding the labyrinth. Group 5 may be either obstruction or hypovirulent infection. Group 6 probably combined with

cerebral polyneuritis. Ruttin quotes a case of recurrent secretory catarrh which finally developed into trigeminus neuralgia. He believes the exudate was the result of trigeminus influence on the blood and lymph vessels.

HISTOLOGY OF SUPPURATION OF THE TIP OF THE PYRAMID. SCHLANDER, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:492 (Nov.) 1925.

Infection may spread from the middle ear through the perilabyrinth cells, under the rather loosely applied dura, or through veins of the carotid canal. Schlander reports his findings in a fatal case, indicating these routes of extension, and states that trigeminal pain from involvement of the gasserian ganglion as it rests in the depression on the petrosa, and paralysis of the sixth nerve, the so-called Gradenigo symptom complex, are characteristic. Isolated sixth nerve paralysis may occur in chronic suppuration associated with labyrinth disturbance.

CONTRIBUTION TO HISTOLOGY OF OTOTUBERCULOSIS. OPPIKOFER, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:500 (Nov.) 1925.

Fifty-four bones of thirty-eight subjects with middle ear tuberculosis were investigated. There were two types, granulating and necrosing. Caries of the ossicles was especially present in granulating tuberculosis. In patients who died from pulmonary tuberculosis, evidences of healing were present in the middle ear. In seven, the canal epidermis had grown into the middle ear and in one the aditus and antrum were entirely epidermized; twenty-nine showed limitation of the process to the middle ear, twenty had inner ear involvement. There was one with acousticus tuberculosis associated with solitary tubercle of the cerebellum; the internal ear showed only congestion; the middle ear was normal.

THE PULSE CURVE IN DISEASES OF THE EAR AND INTRACRANIAL COMPLICATIONS. NUEHSMANN, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:522 (Nov.) 1925.

This author says that bradycardia is not necessarily due to increased intracranial pressure, but may be due to irritation of the vagus center alone. He quotes cases in which spinal puncture showed no increased intracranial pressure, and others in which the bradycardia occurred during the receding stage of meningitis, from which the patients recovered. Three cases are reported in detail.

CASE 1.—Labyrinthitis with slow pulse, spinal fluid pressure increased (185 mm.) 200 lymphocytes, no leukocytes. Pressure came down to 80 mm., cells to 30, but no change in pulse. Radical mastoid and labyrinthectomy was followed by an elevation of pulse rate, which reached normal in fourteen days.

CASE 2.—A boy, aged 12 years, had a cholesteatoma and a perforation in Shrapnell's membrane. Modified radical operation was followed by a slow pulse (50). The temperature was normal. Six days thereafter after change of dressings, which showed considerable secretion, and application of looser tamponade, the pulse returned to normal.

CASE 3.—Radical operation; pulse 48; fourth day there was slight, non-characteristic nystagmus. When the dressings were changed, the pulse returned to normal.

The author believes bradycardia may be due to toxic influence on vagus center, and suggests further study of pulse curve in connection with temperature in meningitis, as an index of its course.

BRAIN PUNCTURE. FREMEL, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:524 (Nov.) 1925.

This author believes the alleged dangers of brain puncture are overdrawn. He claims that experience shows that there is practically no danger to the brain substance per se in simple puncture. Puncture of a ventricle may be dangerous, but is rare. In an abscess, the ventricle is usually crowded to the opposite side and is not so easily reached. As to the danger of carrying in infection by the puncture, he considers this not proved. All cases investigated already had fatal pathologic changes regardless of puncture. Of course, spreading with forceps and other gross injury may lead to infection, otherwise this risk is small. He believes the greatest danger is bleeding, and reports thirty cases of meningitis in which exploratory puncture was done for abscess, with two cases of fatal bleeding, and two others in which the bleeding hastened the end. A needle puncture only was used. Case 3 of the four fatal cases had sinus thrombosis and jugular ligation in addition to the lumbar puncture (which was practiced in all), and he believes the combination of withdrawal of spinal fluid and venous stasis the principal determining factors in the hemorrhage after puncture.

HISTOLOGY OF TUBERCULAR LABYRINTHITIS. DEUTSCH, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:565 (Nov.) 1925.

Two forms of new bone formation are described: 1. Metaplasia of connective tissue; bands and islands of osteoid tissue form in the young connective tissue. They are recognizable by their affinity for acid dyes, their almost structureless appearance and the resemblance of the cells to connective tissue. This form is apparently induced by reaction to toxins rather than directly to suppuration, and its characteristic is the absence of a layer of osteoblasts.

2. Bone formation as a product of inflammatory reaction. This shows early rings and bands of bone tissue; it has characteristically an osteoblastic cell layer. This type occurs especially in meningitic labyrinthitis, in which it takes the form of an ossifying periostitis. A case of labyrinthine tuberculosis is reported in detail, with illustrations showing ossification of the labyrinth with complete obliteration of all its cavities.

LEWY, Chicago.

Nose

GRAVE PSYCHIC DISTURBANCES IN SUPPURATIONS OF THE NASAL ACCESSORY CAVITIES. LUDWIG SOYKA, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:307 (Dec. 8) 1925.

Hajek mentions that any condition of congestion and depression can follow diseases of the nasal accessory cavities. Soyka describes a case of grave psychic disturbances of this nature. In 1913, the patient, a man, aged 29, suffered severe pain in the right frontal sinus. He talked very much, hastily and precipitately, and his speech was disturbed. In Vienna, a radical Killian operation was performed; all disturbances disappeared after this. In 1916, the headache appeared, accompanied by nervousness, distraction, forgetfulness, fast and hasty talking, weakness of the will, lack of energy and mental uncertainty. In 1921, the condition became worse. The patient lent much money, became extravagant, contrary to his former habit, deviated from the truth and could not distinguish between right and wrong. Buzzing in the head was

noted; the patient suffered from fear and believed he would become insane. In 1923, the patient suffered again from unbearable headache; the right side of the forehead became swollen and he had spells of vomiting. He was again operated on in Vienna. After the operation, the wound was kept open for about nine months. There was no improvement; the patient became a morphine addict and also sniffed cocaine. He had attempted to commit suicide before he was admitted to the psychiatric clinic. In the clinic, the patient suffered from unbearable headache, his temperature rose, he vomited, and the old wound over his right eye was swollen. He was transferred to the ear, nose and throat clinic. The examination of the eyes showed an absolute central scotoma on both sides, pain on motion and retropulsion pain; the optic nerve appeared to be normal. The diagnosis was: encapsulated suppuration of the frontal sinus with cerebral irritation. Dec. 9, 1924, three cavities were laid bare, and pus was evacuated from all three. A broad communication with the nose was established. During the after treatment, an acute empyema of the left frontal sinus was opened from the nose. Immediately after the first operation all mental disturbances disappeared, the patient's mind became active, he desired to work, and the morphine habit disappeared. Either an abnormally large frontal sinus was present which was divided by septums into different parts, or abnormally situated ethmoid cells were present. Soyka thinks that the latter was the case, and that the exit into the nose was obstructed by cicatrical tissue, after the operation. Alden mentioned that only five cases of this kind are reported in the literature.

THE NATURE AND CLINICAL SIGNIFICANCE OF A NASAL AND VASOMOTOR REFLEX-PHENOMENON. O. MUCK, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:311 (Jan. 18) 1926.

Gruenwald has stated that the erectile tissue in the nasal mucous membranes are interposed bodies which get their blood supply from the smallest capillaries of the surface which originate in the postnasal artery, and which have their outflow into the veins of the submucosa. The walls of these vessels are rich in elastic fibers and powerful layers of muscles which reach into the lumen in the form of trabecular prominences. This description shows that the formation shows muscles of the vessels developed to a degree which is otherwise characteristic for arteries. Muck has shown that vasomotor reflex phenomena can be elicited at the anterior end of the lower turbinate. If the nasal mucous membrane is slightly sprayed with a 1:1,000 epinephrine solution, and if this ischemic spot is touched after a few seconds with the smooth head of a probe from three to four times, with moderate pressure on the same spot, a vasodilatory reflex appears in the form of a streaky or spotted redness, which disappears after from one to fifteen minutes. This holds good for healthy persons. In certain diseases, and with many pregnant women, the pharmacologic and mechanical irritation show a different picture. On the spot touched by the probe, a plain white spot can be seen which lasts longer than the ischemia caused by the epinephrine, namely, up to ten minutes. The white streak formation shows that the probe has created a renewed vasoconstriction of the mucous membrane which has been treated with epinephrine. No other mucous membrane in the head shows this phenomenon. It will probably be of importance in internal medicine, in neurology, syphilology and in gynecology. Muck claims that his experiment permits examination of the hyperexcitability of the sympathetic system of the head.

The author has made 5,000 experiments. He found that the vasoconstricting reaction, namely, the white streaks in patients suffering from hemicrania sympathicotonica, before and after the attack. During the periods free from attack, it is sometimes missing but not always. He also found that the reflex phenomenon presented itself with extraordinary frequency on that side of the nose which corresponded with the side of the head on which the pain was located. Therefore, he concluded that in true migraine, the assumption of spasm of the arteries of the brain is proved.

The simple epinephrine probe experiment permits the examiner to learn the condition of the tonus of the meningeal vessels in diseases. The sympathetic hypertonia of the vessels of the brain was found in epileptics and in pregnancy. In certain cases of Ménière's syndrome, the angioneurotic character of the injury of the labyrinth could be established. In these instances, however, the Wassermann reaction of the spinal fluid is sometimes obligatory, because Muck found that in the late stages of syphilis the white streak could be seen.

Among thirty patients suffering from late syphilis, the vessels of the brain of twenty-nine were sympathicohypertonic. It must be added that in many examinations on healthy people, the epinephrine probe experiment did not show any white streaks. It is remarkable that the white streak formation could plainly be seen in patients who had a syphilitic infection, and in three patients suffering from tabes dorsalis, although the Wassermann reaction of the spinal fluid was negative. The epinephrine probe experiment, therefore, shows that the syphilitic infection has caused an injury to the vessels of the brain and this could still be shown after the "cure."

The hypertonia of the vessels can also be caused mechanically. Patients with a severe injury to the head responded to the epinephrine probe test, even if the accident had happened many years ago. The epinephrine probe test is also important in rhinology, when a patient complains of headache on one side of the head, or of repeated headaches. One should think of migraine and syphilis, and one should not assume, without further examination, a disease of the nasal accessory sinus in chronic rhinitis, or, if a shadow can be seen in the roentgen picture. Muck saw a woman whose ethmoid cells had been removed thoroughly. There was no pathologic secretion, the frequently appearing headache was not cured. The patient suffered from a typical migraine (epinephrine probe test). There may be differences in explanation of the vasomotor reflex phenomena. The mucous membrane covered with crusts is unfit for the tests, because the inflamed mucous membrane reacts badly to epinephrine, also the mucous membrane of patients suffering from ozena, even without crust formation. A narrow lower turbinate, or spurs of the septum make the examination sometimes difficult. The strokes of the probe must touch the same spot. In must be considered that in many people a vessel island is found at the anterior pole which does not react to epinephrine (venectasy?). In pregnant women the picture caused by the probe disappears sometimes after one minute, whereas in people suffering from hemicrania, epilepsy and syphilis, also from head injuries, the picture may remain fifteen minutes or longer. The findings should be put down as follows: "reflex redness also still visible after five minutes, or sharply defined streak picture on the left side; on the right side disappearing epinephrine paleness, etc." Series examinations in healthy and diseased persons will show that the epinephrine probe test is valuable for diagnostic purposes.

AMBERG, Detroit.

Miscellaneous

EXPERIENCES WITH 150 ENDONASAL DACRYOCYSTOTOMIES. F. BOCKSTEIN, Ztschr. f. Hals-, Nasen- u. Ohrenh. **13**:223 (Dec. 8) 1925.

1. Endonasal dacryocystotomy in dacryocystitis and its consequences lead to a cure in 96 per cent of the cases. Restoration of function of the lacrimal duct resulted in 84 per cent of the cases.

2. The operation is indicated in all manifest cases of dacryocystitis with its complications (phlegmons, fistulae, etc.), because in the great majority of cases the stricture of the nasolacrimal duct is the cause. In simple epiphora, however, the cause lies mainly in the lacrimal ducts, above the sac.

3. The operation is without danger and is accompanied by little pain. It can be performed in old people and in children, and can be done in the outpatient department.

4. Ozena and trachoma (in the second and third stages) are not a contra-indication.

5. The operation is especially indicated in dacryocystitis with complications of the eye, on account of the quick disappearance of secretion of pus and microbes after the operation.

6. The careful after treatment and secondary operations in relapses determine the end-results, as well as a correct indication and technic.

It is to be regretted that dacryocystotomy does not solve the question of epiphora completely. A great number of cases of simple epiphora, without dacryocystitis, remain when the operation is not indicated. One should never extirpate the lacrymal sac, if one can expect the reappearance of the function in dacryocystitis. Therefore, the extirpation of the lacrimal sac must be reserved for extraordinary cases.

AMBERG, Detroit.

FROM THE PROCEEDINGS OF THE GERMAN OTOLARYNGOLOGIC SOCIETY

DIATHERMIA PUNCTURE IN TUBERCULAR ADENITIS. HOFVENDAHL, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:658 (Nov.) 1925.

This author reports a case of a large tubercular cervical gland which had not responded to quartz lamp treatment; roentgen-ray treatment was refused. An insulating trocar was used through which needle was introduced into the gland the required depth; the other large electrode was applied on the other side of the neck, 300 milliamperes were used one minute. Two applications were made three months apart. The gland disappeared in six months without scar or danger.

PATHOLOGY OF THE VESTIBULAR NERVE IN VARIOUS AILMENTS. MAUTHNER, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:660 (Nov.) 1925.

In general, the vestibularis is affected mostly by diseases or disturbances of central origin, e. g., epidemic encephalitis in which it shows overexcitability. The general rule is overexcitability in the initial stages and residual stages of disease. Not only various diseases, but various stages of them bring about varying vestibular reaction. This author investigated twenty-one cases of

nephritis. During the acute stage (bloody urine, edema) there was over-excitability, followed by hypo-excitability, then by an approximately normal period, so that most cases in the chronic stages gave normal reactions. The reactions were sometimes different on the two sides. He classifies the cases as toxic, vasomotor or a combination of both.

EXPERIMENTAL CENTRAL LOCALIZATION OF COMPENSATORY NYSTAGMUS AFTER UNILATERAL LABYRINTH DESTRUCTION. DEMETRIADES and SPIEGEL, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:630 (Nov.) 1925.

Cats and rabbits were used. After the destruction of the left labyrinth, spontaneous nystagmus to the right appears. If the right labyrinth is immediately destroyed this disappears, but if some days intervene until the spontaneous nystagmus to the right recedes and the right labyrinth is then destroyed, nystagmus to the left (the first destroyed side) appears. (Named after its discoverer, Bechterew's Compensatory Nystagmus.) It has also been observed in human beings by Voss. This is not affected by optical or neck muscle impulses. Removal of homolateral half of cerebellum after labyrinth destruction does not prevent appearance of compensatory nystagmus; removal of the brain in front of the corpora quadrigemini, with preservation of the oculomotor nuclei, does not prevent it; destruction of the contralateral (right) medullary nuclei does not prevent it. Destruction of the nuclei of the left (first destroyed) labyrinth stops the Bechterew's compensatory nystagmus. The phenomena are explained by heightened irritability of the medullary nuclei of the first destroyed labyrinth.

Endolymph movement excites nystagmus, but has nothing to do with its duration. The appearance of compensation in rotation nystagmus is explained on the same basis or hyperirritability of the nuclei of the destroyed side gradually overcoming impulses from the healthy side.

The question of nystagmus to the same side in cerebellar abscess after labyrinth destruction is explained by the theory that the cerebellum exercises inhibitory influence on the nystagmus center of the homolateral side. When this cerebellar inhibition is lifted from the medullary nuclei, increased nystagmus appears or recurs on the destroyed side.

RADICAL MASTOID OPERATION VIA THE EXTERNAL CANAL. VON EICKEN, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:502 (Nov.) 1925.

Von Eicken uses a burr working against a hook which is hooked into the overhang of the attic or aditus. The skin is first cut into flaps of any form, which are retracted outside the canal. All bony projections are removed. The facial spur is removed by Thiess chisels. The operation is limited to cases of sclerotic mastoids without complications such as sinus thrombosis, brain abscess or labyrinthitis. If the perforation is insufficient to admit the hook, a piece of the lateral wall is removed by a chisel punch. The skin flaps may be replaced or cut off if useless.

HISTOLOGY OF THE LYMPHATIC GLANDS IN SINUS INFECTION. J. POPPER, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:556 (Nov.) 1925.

Popper reports three types of cases of jugular thrombosis associated with cervical lymphadenitis, in which the lymph gland infection appears to have preceded and have causal relation to the venous invasion.

PATHOLOGY OF OTOGENIC THROMBOPHLEBITIS OF THE CAVERNOUS SINUS. BRUNNER, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:559 (Nov.) 1925.

The author states that cavernous sinus thrombosis is a more frequent complication then is usually realized. It most often occurs in connection with meningitis, but also without it, and in connection with other sinus infection. He also states that the infection travels along the carotid plexus more often than has been heretofore realized.

TREATMENT OF BRAIN ABSCESS WITH AUTOVACCINE. UFFENORDE, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:558 (Nov.) 1925.

Case 1.—A boy, aged 12, had hemorrhagic accessory sinus disease with orbital abscess, radical operation, and later frontal lobe abscess and osteomyelitis of the frontal bone. There was a large and persistent hernia which communicated with the ventricle, and the child was apparently moribund. Milk and other nonspecific protein injections were tried without result. An encapsulated bacillus was cultured from the pus from which vaccine was made; each injection caused a definite drop in fever with subsequent rise of lesser degree until after the fourth injection when the temperature remained normal. There was recovery with persistent hernia, over which the patient wore a metal protector.

Case 2.—An adult, aged 26, had chronic suppurative otitis media since childhood, with cholesteatoma; labyrinth fistula symptom; radical mastoid operation; the dura over both middle and posterior fossae were abnormal but exploratory punctures were negative. There were increased posterior fossa symptoms; reoperation with discovery of cerebellar abscess and hernia. Counteropening resulted in two hernias; there was slow pulse and Cheyne-Stokes respiration. Nonspecific protein injections were given without result. A proteus like bacterium from the abscess secretion was cultivated; after the second injection of this autovaccine, a severe reaction followed which was almost fatal, followed by relief of choked disk and other neurologic symptoms, with recovery except for nystagmus, weakness of extremities and slight nerve disturbances.

FURTHER EXPERIENCES WITH BLOOD URIC ACID AND NERVE DEAFNESS. GERMAIN, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:587 (Nov.) 1925.

Another series of cases is reported, indicating a causal relationship and improvements in the hearing and head noises by a purin free diet and "cinchophen." The blood is tested after three days' purin free diet by the Folin-Neubauer colorimetric method, and more than 3.5 mg. per hundred cubic centimeters is considered excessive.

NYSTAGMUS OBSERVATION DURING TURNING. FRENZEL, Ztschr. f. Hals-, Nasen- u. Ohrenh. (Supplement) **12**:637 (Nov.) 1925.

Frenzel had constructed an instrument on the principle of the periscope, which enables the observer to stand still and see the eye movements of the patient during turning. A bright light in his spectacles prevents ocular fixation movements by the patient, and illuminates the eye for observation. Frenzel finds a vestibular nystagmus present (as distinguished from an oculomotor type railroad nystagmus) even during slight turning.

LEWY, Chicago.

Society Transactions

COLLEGE OF PHYSICIANS OF PHILADELPHIA, SECTION ON OTOLOGY AND LARYNGOLOGY

Jan. 20, 1926

FIELDING O. LEWIS, M.D., *in the Chair*

A UNIQUE COMPLICATION OF TONSILLECTOMY. Presented by DR. HORACE J. WILLIAMS.

Dr. Williams reported the breaking of a tonsil snare wire during tonsillectomy on a child, with escape of the smaller wire fragment. This fragment lodged in the right lower lobe bronchus. The operation had been performed by a hospital intern. After localization by roentgen ray, the wire was removed by Dr. Chevalier Jackson on the day after operation. A plea was made for careful inspection of all instruments, teeth, etc., before performing tonsil operations.

ACUTE LARYNGEAL EDEMA. Presented by DR. DAVID HUSIK.

Dr. Husik classified laryngeal edemas as follows:

First: Acute inflammatory infectious type secondary to localized adjacent inflammation, or occurring during some infectious disease such as scarlet fever, influenza, or typhoid fever.

Second: Noninflammatory, noninfectious type caused by foreign bodies, burns, passive congestion, potassium iodide, and angioneurotic conditions.

Two cases requiring tracheotomy were reported: one followed tonsillectomy; the other, a peritonsillar abscess.

DISCUSSION

DR. GABRIEL TUCKER emphasized the necessity of routine laryngeal examinations. When marked inspiratory retraction of the suprasternal notch is present, however, low tracheotomy should be performed immediately, postponing more thorough examinations until the patient has been freed from the danger of asphyxia. The subglottic form of laryngeal edema needs attention. Here the laryngeal and tracheal mucosa are involved. This type is especially liable to follow foreign body aspiration, especially if that foreign body is a vegetable substance. In vegetable substances, some especially irritative principle is apparently present. After bronchoscopic removal, the edema frequently increases and a tracheotomy must be performed. The importance of careful postoperative care in tracheotomy was emphasized. Attention was called to the danger of giving even small doses of potassium iodide in laryngeal conditions. Such therapy often precipitates a dangerous laryngeal edema. In 33 per cent of the deaths following angioneurotic laryngeal edema, death was due to want of tracheotomy.

DR. E. B. GLEASON spoke on the occurrence of laryngeal edema in urticaria. Dehydration by croton oil is often of value in these cases.

DR. JAMES BABBITT referred to a case of laryngeal edema that followed catheterization of the eustachian tube, in which tracheotomy was not required.

Dr. Fielding O. Lewis cited two cases of acute edema of the larynx following vaccine administration in hay-fever patients. Operation was not required. It was his feeling that the case reported by Dr. Williams is a timely warning to those performing throat operations to inspect instruments thoroughly before performing operations. A snare so devised that long wires are attached to the handle of the instrument would overcome the danger of snare wire inhalation.

Dr. George B. Wood suggested twisting the free ends of the snare wire.

Dr. George M. Coates endorsed this method. It can be used only with the softer varieties of snare wire.

Dr. George Fetterolf spoke of the fragmentation of the cutting blade of a LaForce adenotome during operation. The fragments were all recovered.

Nonendoscopic Cases of Foreign Bodies in the Tonsil. Presented by Dr. Louis H. Clerf.

Attention was called to the frequency of the lodgment of fish bones, tooth brush bristles, tooth pick fragments, bony spicules, plant stems, etc., in the tonsil crypts or substance. Those who wear dentures are more liable to this condition, as the sensitive oral mucosa is the natural protective mechanism in the detection of foreign bodies in the material taken into the mouth. When a foreign body has lodged in the tonsil, the pain or discomfort is usually localized to that side but may not refer directly to the tonsil. The diagnosis is made by inspection, and removal is accomplished without endoscopy. Sometimes a tonsillectomy is required when the foreign body has become embedded.

Our Present Knowledge of Procaine, with a Brief Report of Experimental Carotid Injection of the Drug. Presented by Dr. Karl Musser Houser (by invitation).

Dr. Houser's paper thoroughly reviewed the available literature on procaine. Particular emphasis was placed on the physiologic and pharmacologic properties of the drug. Attention was drawn to the work of certain investigators who had been able to save the lives of animals which had been used for experiments, and which had been given lethal doses of procaine, by artificial respiration, cardiac massage, and epinephrine chloride intravenously. Artificial respiration and cardiac massage alone were unable to produce these results. In his own experiments he injected the internal carotid artery of dogs with double the procaine dosage usually used in performing tonsillectomy under local anesthesia, in the attempt to learn whether the immediate distribution of fairly large doses of procaine to the higher centers would cause death. None of the dogs so treated died.

DISCUSSION

Dr. E. L. Eliason (by invitation) spoke of the widespread use of procaine in general surgery. He recommended the use of a 0.5 per cent solution. This gives adequate anesthesia if the operator is willing to give it a little time. In the use of local anesthesia, the phlegmatic person is by far the best patient. Local anesthesia by infiltration should not be used in the neighborhood of infection. Patients who have had abdominal operations have a less stormy convalescence when local anesthesia is used. Great care should be exercised in the preparation of the solution injected.

Dr. James A. Babbit asked the influence of epinephrine on the toxicity of procaine.

Dr. Houser stated that Easman, Erdman and Bonn had found that epinephrine chloride added to procaine solutions increased the toxicity two and three-fifths times when tested intravenously on rabbits. This disadvantage, however, was offset especially in tonsil work by the delayed absorption and lessening of hemorrhage.

Atrophic Rhinitis—A Clinical Study. Preliminary Report. Presented by Dr. A. J. Wagers.

Dr. Wagers reported on twenty-two cases of atrophic rhinitis, which had been systematically studied and treated. The average age of these subjects was 25 years. Headache was present in some degree in eleven. The sense of smell was lost in six, impaired in ten others; hearing was impaired in six. In eleven cases there was evidence of sinus disease by transillumination. Sinus roentgenograms of eleven cases were taken. Nine of these showed sinus pathologic changes. The blood usually showed a slight secondary anemia. The treatment given was two quart irrigations with physiologic sodium chloride solutions three times daily. By this method, symptomatic cures occurred in all cases; objective improvement of the atrophy was questionable.

DISCUSSION

Dr. George Coates mentioned the paper of Kauffman who maintained that in this condition maxillary sinusitis was always present. Certain British observers consider that acid fast bacilli give rise to the ailment. The Perez bacillus and treatment by vaccines made from this bacillus were also discussed. Dr. Coates in his own investigations was unable to isolate this bacillus. In the cases investigated by him, a Friedlander bacillus was found. Vaccine therapy with this bacillus gave temporary symptomatic relief.

Feb. 17, 1926

Oral Investigation in Johns Hopkins Hospital. Presented by Dr. S. J. Crowe (by invitation).

Dr. Crowe spoke of the work concerning aural investigation which is being planned and carried out at the Johns Hopkins Hospital. With the idea of correlating ear function with microscopic findings on a large scale, the following plan is being followed. All patients admitted to the medical wards are subjected to complete otolaryngologic examination. This includes objective findings of ear, nose, and throat and complete functional tests including audiograms. The results of these examinations are carefully recorded, cross indexed and filed.

On the death of a patient, if permission for necropsy is available, the temporal bones are removed by an electric saw and prepared for the cutting of serial sections. The time between death and necropsy is carefully noted. In a special laboratory serial sections are prepared, cross indexed and filed. In time, there will be available a huge mass of necropsy material that can be readily correlated with the antemortem findings. The difficulties encountered in this work are many. It is often impossible to have the necropsy performed sufficiently soon after death to avoid changes. The technic of decalcifying the specimens and cutting of sections is not easy.

Another plan which is being followed has much to recommend it. Each year, some investigator who has done outstanding work on the subject of the ear, is invited to come to the University and to remain there for a year

engaged in investigative work relative to some phase of the ear. A special fund makes this possible. Dr. Stacy Gaul, associate professor of Anatomy of the University of Michigan, is at present filling this position.

Dr. Crowe's talk was illustrated with numerous audiograms and microscopic sections found in various ear conditions.

DISCUSSION

Dr. A. B. Randall: This programme deserves high praise. In my opinion, the value of the audiometer is questionable because I feel that in transmission through the head phone some distortion of sound probably occurs.

Dr. Ralph Butler: In the treatment of ear conditions, accurate knowledge of the pathology is so important that such studies as those undertaken by Dr. Crowe and his staff are of the utmost value. It is my wish that Dr. Crowe would return in several years and give in detail the results of this vast work.

Dr. Crowe: All audiometer examinations were controlled by tuning fork tests. There is much to be gained and learned from bone conduction tests made with the audiometer.

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